NORTHERN DISEASED BISON

ENVIRONMENTAL ASSESSMENT PANEL

COMPENDIUM OF SUPPLEMENTARY SUBMISSIONS

MARCH 1990

91-06256/

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1

March, 1990

TO THE READER:

The following compendium of information contains submissions received by the Northern Diseased Bison Environmental Assessment Panel during the final public hearings, held between January 16 and 26, 1990, which were not read into the public record, and submissions received by the Panel subsequent to the final public hearings up to the March 02, 1990 deadline for written submissions. The enclosed material is intended to complement the material found within the verbatim transcripts prepared for each of the final public hearings. Copies of the transcripts and this compendium have been placed in the following public viewing centres along with previously released materials:

1. All Band Offices of the Native groups involved in the Review;
2. public libraries in the communities of Fort Vermilion, High Level, Fort Smith, Hay River, Grande Prairie, Fort McMurray, Peace River and Yellowknife;
3. Arctic College Library in Fort Smith;
4. the main branch of the public library in both Calgary and Edmonton; and
5. the University of Alberta library.

Colin Lachance
Executive Secretary
Northern Diseased Bison
  Environmental Assessment Panel

3

Received
Jan 15, 1990
Vancouver

Anecdotal Critique Of Non-Governmental Submissions To The Northern Diseased Bison Environmental Assessment Panel

Submitted by: N.S. Novakowski, PhD
January 11th, 1989

Introduction

There have been a number of submissions (interventions) to the Northern Diseased Bison Environmental Assessment Panel. While many of the submissions are of a technical nature, some are from representatives of communities surrounding Wood Buffalo National Park (WNBP) and state various community positions vis a vis the diseased bison situation while others were of an anecdotal nature which gave the Panel the benefit of collective or individual wisdom and opinions of individuals or groups. More specifically, it is the opinions of Mr. Frank Laviolette that I wish to address. While seeking his understanding of my purpose in doing so, the Panel can be apprised of the facts opined by him in their proper chronological order and without prejudice.

I am referring to his submission No. 5 (your file) entitled Needle Lake - Providence Wood Bison Transplant Report, echoed as well in the Compendium (page 201-217, your file) as Native Perspecitves on the Northern Diseased Bison Issue: An Outline by Theresa A. Ferguson. It surfaces again in Diseased Bison in Wood Buffalo National Park - An Aboriginal Perspective by the Dene Cultural Institute, Yellowknife, N.W.T. There is a seeming perversity in how to score points based on oft-repeated rumour and innuendo, even though I believe that Mr. Laviolette is sincere in his opinions.

Anecdotal Critique Of Submission #5

The Laviolette story, although well-intentioned, is riddled with inaccuracies and innuendo. These aberrations stem from his confusion of two wood bison trapping periods, one in 1963 and the other in 1965 (at which he played an important role). With respect to the involvement of the native people in both operations, he doesn't know the half of it.

The 1963 Operation

The building of the corrals began in 1961. The Needle Lake corral was built during the summer of 1962 in a wet marshy area south of the lake. That meant that the workmen (all Fort Smith native people but one) put down the posts into the wet earth/shallow water mix such that the entire 200 acre circular structure would freeze in during the winter, which it did.

During the summer construction period, the workers were constantly working up to their knees in water and muck and shunned hip-waders for sneakers. To their everlasting credit, they persevered and got the job done. That by far was a greater contribution than that alluded to by Mr. Laviolette.

The round-up and testing was done in March of 1963. The animals were rounded-up and herded into the corral by helicopter in relatively mild temperatures (9° F). Then, under the direction of Dr. Frank Gallivan, Veterinarian in Charge, Northern Alberta Region, Health of Animals Branch, the corralled bison were tested for tuberculosis and brucellosis.

The following day, a large number of the animals were down on their haunches, unable to move. No diagnosis was made at the time, but the affliction was believed to resemble white muscle disease, a weakening of the hindquarters caused by a selenium deficiency. In this instance, therapy involving Vitamin E injections was suggested. This was tried, both at the corral and later at Hay Camp, but without success. Everyone involved was of the opinion that everything possible was being done to save valuable animals. Nevertheless, the subsequent invective and over-reaction by people unaware of those efforts or ignorant of the facts was appalling.

It was not until much later that the affliction, 'capture myopathy,' was reported in the literature. Over time, hard-driving of some wild animals produces an over-accumulation of lactic acid in the muscles. Correction through the intravenous infusion of salts within the first half hour is necessary to combat it. Obviously, this information became available after the fact. Yet the nonsense persists.

The 1965 round-up at Needle Lake was uneventful, although it was carried out in extremely cold weather (-40° F). The animals that tested disease-free were taken to the Fox-Hole Facility on the Salt Plains west of the Salt River. In early August, 1965, they were transported to Bell Rock and loaded onto a Northern Transportation barge. They were then shipped to Hay River. At Hay River, they were off-loaded onto Grimshaw Trucking cattle-liners and trucked to Elk Island National Park (east of Edmonton) where they were released.

The 1965 shipment to Elk Island National Park from the holding corral at the Fox-Hole site was not without incident. The cattle-liner used from the holding corral to the barge was a converted general purpose metal trailer in which air slots had been cut out with a cutting torch. A regular cattle-liner was unavailable because it was mid-summer and the highway from the

Pine Point turn-off to Fort Smith was not yet completed. Hence, a commercial cattle-liner could not have been brought in on such short notice.

In any event, the make-shift cattle-liner would have been adequate had we not loaded so many bison into the trailer at mid-day of the hottest day of the year, July 29, 1965. The temperature was 82° F. Six animals were lost due to over-heating. The second loading was completed in the early morning, July 30th, without further problems.

In retrospect, although there were many people at the first loading who might have intervened and questionned our judgement, they did not. The matter was no more and no less an error in judgement, which was regratable. However, for anyone who understood the circumstances, in total, the recrimination that developed over the years about the incident showed only an abysmal ignorance, particularly by those who weren't even there.

With respect to Mr. Laviolette, however, he has cause for his point to be heard, although his chronology of events is scrambled. The bison arrived by barge at Hay River, August 2nd, 1965. Since it was a civic holiday, no one would volunteer to accompany me to Hay River to load the bison onto the cattle-liner. Mr. Laviollette, however, gave up his holiday to do so. Over the period of years since then, Mr. Laviolette has conducted an outfitting business for bison hunting at Hook Lake and is thus knowledgable about the local bison population.

Since no hunting of bison has been permitted in WBNP since its inception, his knowledge presumably stems from observations of bison outside of WBNP. The same is likely true of other local people. Nevertheless, such information is valuable and should be actively solicited.

Further to some of his other points, Dr. Laurent Choquette, when he was in Fort Smith, heard from a number of local people ('old-timers' in his words) that there were bison 'die-offs' in the past, even before the first shipment of plains bison arrived in 1925. I heard similar statements. Such past observations could be embellished over time. Nevertheless, the narrators were credible, and maybe there is something to it. To my knowledge and that of Dr. Choquette's, no investigation to prove or disprove the statement of Mr. Laviolette and others has ever been carried out.

Received by Fax
Ft. Vermilion
Jan. 16. 1990

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SUBMISSION TO E.A.R.P. PANEL

ON

NORTHERN DISEASED BISON

ENVIRONMENTAL ASSESSMENT

BY

TREATY #8 CHIEFS AND METIS LEADERS

FROM IN AND AROUND WOOD BUFFALO NATIONAL PARK

January 15, 1990
Fort Smith, Northwest Territories

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NOTE TO EARP PANEL:

Please give your immediate attention to the recommendations outlined at the end of this submission. There will be written and oral presentations made to the hearings but there is no way we can submit same in advance of the hearings given the time frame you have set.

INTRODUCTION:

On January 13, 1990 a meeting was held in Fort Smith, N.W.T. Community representatives from in and around Wood Buffalo National Park gathered. They addressed the aboriginal concerns regarding Agriculture Canada's proposal for eradication and recovery of a healthy buffalo population in and around Wood Buffalo National Park.

Nineteen community groups comprised of bands, Métis locals and community councils were represented at the meeting. They are as follows:

Fitz-Smith Native Band
Metis Local #50, Fort Smith
Town of Fort Smith
Hay River Dene Band
Hay River Metis Association
Fort Resolution Metis Association
Fort Resolution Band Council
Fort Chipewyan, Athabasca Chipewyan Band
Fort Chipewyan, Improvement District #8

Little Red River Band -	Fox Lake
	John D'or Prairie
	Garden River
Dene Tha' Band	High Leval
	Assumption
	Meander River
	Boyer River
	Zama Lake

Our discussions revealed a number of concerns which are not reconcilable with any options suggested by the Bison Task Force Report and particularly the eradication and replacement program proposed by Agriculture Canada.

Major Concerns include:

1) potential loss of healthy buffalo which presently exist within and around Wood Buffalo National Park.

2) the ecological impact of the removal of a major component of the park ecosystem.

3) the ultimate destruction of a key component of the aboriginal peoples' economy, lifestyle and culture.

4) the extensive time frame for recovery of huntable populations, particularly in view of unpredictable climatic and habitat changes along with changes in

predator/prey relationships and unpredictable natural or man-made disasters.

5) the loss of the buffalo population from W.B.N.P. also threatens the park's value as a major tourist attraction and viable source of regional revenue and most importantly it's continued existence as a national park.

6) the loss of disease-free buffalo south of W.B.N.P. is also believed to be the first step in destroying the native renewable resource economy and the opportunity for co-management of the resource between aboriginal people and the government of Alberta. The self sufficiency and cultural strength of our people would be erroded.

While we agree that development of a disease-free herd is an ideal objective, we are confident that the data used to support the course of action is both inadequate and inaccurate and connot be used to support such a drastic solution to the disease problem.

We are also not satisfied with E.A.R.P. handling of the process with no environmental or socio-economic impact assessment (EIA/SEIA), no response to requests of intervenor funding and no representation by aboriginal people and other buffalo users. Furthermore the process does not allow communities to review panel recommendations or to critically examine them at the end of the hearing process and before they go to Environment Canada. As a result of all the above we have prepared a public statement of our recommendations to the panel as described below.

Delegates to the meeting (listed on previous page) agreed on the following recommendations:

1. We oppose the buffalo slaughter being proposed by Agriculture Canada.

2. We request that a full EIA/SEIA of Agriculture Canada's proposal be undertaken. At minimum this will involve collection and reviews of all existing information into an environmental impact assessment, the identification of any deficiencies, and the preparation of EIA/SEIA reports that address these deficiencies.

3. We request that the panel change it's time line to a six-month extension for public hearings to allow preparation and full public review of the EIA/SEIA

and especially to allow aboriginal people to undertake intervenor action.

4. We request that the proponent, Agriculture Canada, provide intervenor funds (see attached budget) to the aboriginal people of this area in the amount of $784,888.00 to allow us to:

   a. Conduct a technical review of EIA/SEIA with the assistance of independent and technical consultants.

   b. Facilitate full community review of EIA/SEIA

   c. Facilitate community-based response to the proposal and to develop our aboriginal counter proposal.

5. We recommend that Agriculture Canada establish a buffer zone around Wood Buffalo National Park within which cattle ranching developments will not be allowed, and that a cattle monitoring program at the edge of this zone be implemented. This buffer monitoring program to remain in effect for an indefinate time period.

COMMUNITIES-WOOD BUFFALO NATIONAL PARK

N.W.T.

1. Fort Smith	Fitz Smith Band Metis Local # 50 Fort Smith Town Council
2. Hay River	Dene Band Metis Local
3. Fort Resolution	Community Council Metis Local

ALBERTA

1. Fort Chipewya	Athabasca Chip Band Cree Indian Band Metis Local Improvement District # 18
2. Little Red River Band	Fox Lake Jean D'Or Garden River
3. High Leval	Dene The` Band Assumption Meander River Boyer River Zama Lake

BUDGET RATIONALE

The budget outline below is designed to facilitate the action that should have been taken long before the public hearing process and schedule was implemented. Without aboriginal community intervention as described in the foregoing statement the future of those to who buffalo are paramount in every economic,social and cultural sense; will be in jeopardy.

Furthermore, the most important component of the economic base of the Wood Buffalo National Park and the adjacent areas will be jepardized. The action as we have described it, will therefore benefit all residents of the region, including non-natives as well as aboriginal people.

One of the most important aspects of our proposal-that is the Counter proposal (see recommendation 4.(c) is already in the preliminary planning stage but requires time and funds for it's development and presentation to the public and to the governments responsible for the conservation of the buffalo resource.

The figures in the attached budget reflects the financial and professional assistance needs of the nineteen communities in and around Wood Buffalo National Park. The numbers used are today's actual cost of conducting business in this northern area of Canada and are regarded as minimum amounts required.

Because of time and distance constraints in carrying out our work there is a great need for early approval of our request. The EARP Panel agenda and time-table is so confining that even with a six month delay in proceedings, we will be pressed to complete our work.

WOOD BUFFALO NATIONAL PARK

EIA/COMMUNITY PANEL HEARINGS

AGRICULTURE CANADA PROPOSAL

1.	Salaries	$ 105,600.00
2.	Travel	$ 22,070.00
	Accomodation and meals	$ 40,575.00
3.	Professional Fees (legal consultants, Audit)	$ 187,000.00
4.	Community Committees	$ 265,200.00
5.	Administration 10% (Rent, Telephone,Fax)	$ 62,046.00
6.	Contingency (10-15% of overall Budget)	$ 102,376.00
	TOTAL BUDGET	$ 784,888.00

1. SALARIES
(Period January 15,1990 to July 15, 1990)

1.	Coordinator (20,000 x 2)	$ 40,000.00
2.	Financial Controllers (15,000 x 2)	$ 30.000.00
3.	Clerical (13,000 x 2)	$ 26.000.00
4.	Benefits @ 10% (CPP,UIC)	$ 9,600.00
	TOTAL SALARIES	$ 105,600.00

2. TRAVEL

AIRFARE CHARTER & VEHICLE MILAGE
(7 Meetings x 2 days) The seven meetings are to allow for the greatest input by the people involved and to ensure fair and equal participation.

from January 15	Fort Smith	1,500.00
February	Fort Chipewan	2,500.00
March	Fort Resolution	4,500.00
April	High Level	2,560.00
May	Hay River	3,550.00
June	Garden River	2,560.00
to July 15	Fort Smith (final Meeting)	4,900.00
TOTAL TRAVEL		$22,070.00

TRAVEL ACCOMMODATION AND MEALS

MEETING PLACE

1. Fort Smith	1,180.00
2. Fort Chipewyan	4,485.00
3. Fort Resolution	3,680.00
4. High Level	8,575.00
5. Hay River	6,750.00
6. Garden River	8,575.00
7. Fort Smith	7,350.00
TOTAL	$40,595.00

3. PROFESSIONAL FEES
(Legal, Consultants, Audit)

a. Audit (NWT & Alta)	$10,000.00
b. Legal i Treaty #8 ii Counter Proposal iii Panel Hearing	$15,000.00
c. Consultants	
Biologists ($400/day @ 60 days)	$24,000.00
Researchers (6 Communities @150/60days)	54,000.00
Field Consultants ($400/dayx2x60days	48,000.00
d. Translation/English Tech (Slavey,chip,cree) (150/day x4=600 x 60days)	36,000.00
BUDGET	$187,000.00

4. COMMUNITY COMMITTEES

Community Mtgs.

a. Honoraria (100/day x 10 membersx12 mtg.	228,000.00
b. Group Meetings(16 meetings) Honoraria (100/day x 31=3100x2=6700x6 (16 mTeetings)	37,200.00
BUDGET	$265,200.00
5..ADMINISTRATION-10% (rent,Telephone,Fax)	62,046.00
6. CONTINGENCY FUNDS (10-15% of overall budget)	$102,376.00

UNIVERSITY
of GUELPH

ONTARIO VETERINARY COLLEGE
Department of Pathology

Received by fax
Hay River
Jan. 18. 1990

21

January 12, 1990

Mr. Paul Scott,
Executive Secretary,
Northern Diseased Bison Environmental Assessment Panel,
510 - 750 Cambie Street,
Vancouver BC
V6B 2P2

Dear Sirs:

Faculty members and graduate students at the Ontario Veterinary College, University of Guelph, wish to make the following brief submission to the panel. We are drawn from the Departments of Clinical Studies, Pathology, Veterinary Microbiology and Immunology, and Population Medicine, with backgrounds encompassing the disciplines of clinical veterinary medicine, bacteriology, epidemiology, public health, wildlife diseases/pathology, zoology/wildlife biology/mangement, and park planning.

We have reviewed the options with respect to the management of enzootic brucellosis/tuberculosis in the Wood Buffalo National Park herd, as described in the Bison Disease Task Force Report "Evaluation of Brucellosis and Tuberculosis in Bison in Northern Canada".

We are unanimously of the opinion that it is in the public interest to attempt eradication of the herd of hybrid bison infected with these diseases, subsequently repopulating Wood Buffalo National Park with wood bison free of brucellosis and tuberculosis (Option 2 as presented by the Task Force).

It is our opinion,that in the long term this option is in the best interest of: the conservation/recovery of wood bison in the Northwest Territories/northern Alberta; the objectives of the National Parks system; animal agriculture in Canada; the public health of the native population and others exploiting bison as game or food animals.

Although this would be a challenging logistical exercise, we believe that the task force has addressed the major issues, and that they are solvable. It is admitted that the ecologic impact of removing the herd for a period of years is unknown. However, the area as it is now probably cannot be considered "pristine", in the sense that it has been subject to the sequelae of the plains bison introduction of the mid 1920's, and the downstream effects of dams and industrial development in the Peace River watershed, among other man-made insults.

If Option 2 were adopted, and breeding herds of replacement animals derived from Wood Buffalo National Park were established, it is our opinion that it would be prudent to adopt a tiered arrangement of "breeder" and "multiplier" herds. Animals salvaged from the park should be placed in several small, segregated and tightly quarantined breeder herds, from which they should never depart alive. Offspring tested free of brucellosis and tuberculosis should be removed to one of several clean, segregated, multiplier herds, from which the ultimate repopulation of the park would take place. This would reduce the vulnerability of the plan to possible discovery of any reactors among the salvaged or multiplier animals some years after the operation began.

We commend the Environmental Assessment Panel for the thorough and fair appraisal which you are making of this difficult issue. We trust that our opinions may be of assistance in the exercise. If any of us can be of additional help to your deliberations, we would be pleased to contribute.

Thank you for the opportunity to make this submission.

Sincerely,

Ian K. Barker DVM PhD

Timothy Blackwell DVM PhD

Trent K. Bollinger BSc DVM

G Douglas Campbell

Douglas G. Campbell BSc MPl DVM

V. Honeyman

Virginia Honeyman BSc DVM

D. Bruce Hunter DVM MSc

S. Wayne Martin DVM PhD

Scott A. McEwen DVM DVSc

Richard B. Miller BSc DVM PhD

N. Ole Nielsen

N. Ole Nielsen DVM PhD

John F. Prescott MA VetMB PhD

Soren Rosendal DVM DVSc

Richard Schneider BSc DVM

Dale A Smith

Dale A. Smith DVM DVSc

David Waltner-Toews DVM PhD

Fort Resolution
Jan. 19. 1990
(8)

23

Questions and Comments from Peter Pedvers, who attended
the panel's hearing in Hay River on Jan.18
and felt that some key issues were not directly addressed.

To Agriculture Canada:

1) Is there an immediate and serious threat to people's health from the diseased bison ?

If the answer is yes, then why have there been no cases of disease among the hunters that have harvested bison for the past fifty years ?

If the answer is no, then this is not an issue that Agriculture Canada can raise in support of its proposal.

2) Given the existing location of bison and cattle, is there an immediate and serious threat that cattle will become infected with TB or brucellosis due to contact with the park bison ?

If yes, how many recorded cases are there of cattle being infected by park bison ? If there are few or no recorded cases, then the threat is not serious. There is, however, a potential threat. Could this threat be eliminated by a ongoing program of containment, assuming that the cattle industry does not expand into bison territory ? If a rigorous program of containment would eliminate the risk of contamination of cattle (this program could include a buffer zone around the bison habitat and a policy of open hunting of bison found outside their prescribed range) then why doesn't Agriculture Canada look into a containment program ?

If the health of the bison themselves is the real issue, then this is not Agriculture Canada's jurisdiction.

If the answer is no, that there is no immediate and serious threat to cattle, then a program of containment could still be implemented as a safeguard.

If people's health is not a serious issue and contamination of cattle can be eliminated through containment, then why not let the herds alone. If their numbers are dropping, so be it. The bison population may continue to drop over a period of time, but this process would be slow and natural, so the ecosystem would have time to adjust. At the point, if it happens, that the bison population is very low, a much smaller scale slaughter could occur, with far less impact on other species, and re-population could be undertaken.

In the meantime, healthy males could be corralled from the existing herd and semen from these bulls could be taken an saved for future artificial insemination. This would ensure that a diverse gene pool would be maintained in the future.

Received
Jan 21 '90
Fort Smith
8

This manuscript has undergone peer review and has been accepted for publication in the Canadian Veterinary Journal.

January 1990

A Survey of Brucellosis and Tuberculosis in Bison in and Around Wood Buffalo National Park, Canada

Stacy V. Tessaro, Lorry B. Forbes, Claude Turcotte. Health of Animals Laboratory, 116 Veterinary Road, Saskatoon, Saskatchewan S7N 2R3 (Tessaro, Forbes); Animal Diseases Research Institute, P.O. Box 11300, Station H, Nepean, Ontario K2H 8P9 (Turcotte).

Please send all correspondence regarding this manuscript to Dr. S.V. Tessaro, Health of Animals Laboratory, 116 Veterinary Road, Saskatoon, Saskatchewan S7N 2R3.

2L

Abstract

Examinations of complete or partial remains of 72 bison found dead in and around Wood Buffalo National Park, Canada, revealed evidence of brucellosis in 18 (25%) and tuberculosis in 15 (21%), with a combined prevalence of 42%. Urease-positive and urease-negative strains of Brucella abortus biovar 1, and strains of biovar 2, were isolated from tissues of bison, including synovium and exudate from severe arthritic lesions. Mycobacterium bovis was isolated from a range of granulomatous lesions that were similar to those reported in tuberculous cattle. Diseased bison had a broad geographical distribution, and were found outside the park on at least three natural corridors. The diseases have a deleterious effect on this population of bison, and pose a health risk to other bison herds, livestock, and native hunters in the region.

Introduction

In 1985, Canada's national cattle population was declared free of bovine brucellosis, and bovine tuberculosis is expected to be eliminated by the end of 1989. Consequently, extraneous sources of these diseases have become increasingly important because of the risk of their reintroduction to cattle. The free-ranging bison (*Bison bison*) population in and around Wood Buffalo National Park (WBPN) (Figure 1) is the only known reservoir of bovine brucellosis and tuberculosis in Canada. The diseases and the hybrid status of the bison population are legacies of a misinformed decision to transport 6,673 infected plains bison (*B. bison bison*) to WBNP during the 1920's. These bison interbred with the estimated 1,500 wood bison (*B. bison athabascae*) that were native to the park region. Concern about the bison has increased as livestock and game ranching enterprises move closer to the park and as three recently-introduced, healthy populations of wood bison develop in the region.

Past information on brucellosis and tuberculosis in bison in WBNP was based on gross lesions, serological tests, and intradermal (caudal fold) tuberculin test results in bison that were driven into corrals and slaughtered at two sites in the park prior to 1967 (1-3). Bacteriological and histological evaluations were not reported, and biotyping methods for *Brucella* were not available. The purpose of the present study was to correlate gross, histological, and bacteriological findings on brucellosis and tuberculosis in bison, and to determine if Brucella biotyping would provide useful epidemiological markers for tracking brucellosis in the region.

Materials and Methods

The study was strictly limited to opportunistic sampling in accordance with research permits issued by the Canadian Parks Service and the Northwest Territories Department of Renewable Resources. Necropsies were to be done on complete or partial remains of bison that died as a result of hunting, poaching, predation, diseases, or natural accidents. Dead bison were located by ground and aerial surveys, and from information provided by local hunters, trappers, park wardens, and wildlife officers.

All major lymph nodes and portions of major viscera were collected whenever possible, based on condition and completeness of the carcasses. A small portion of each tissue was fixed in 10% neutral buffered formalin for histological evaluation, and the remainder was frozen at -20°C for subsequent bacteriological assessment. When possible, blood samples were collected from the jugular vein, carotid artery, or ventricles of the heart; blood was centrifuged, and the serum was collected by pipette and stored at -20°C for later serological testing.

Formalin-fixed tissues were processed to paraffin, sectioned at 6 µm, and stained with hematoxylin and eosin for light microscopic examination. Duplicate sections were stained by the

Ziehl-Neelsen method whenever any gross or microscopic lesions were seen. Sections of Mycobacterium avium-infected tissues were used as controls for the Ziehl-Neelsen stain. A minimum of 100 fields were examined at 1000 x magnification for acid-fast bacilli in granulomatous lesions.

Sera were tested for Brucella antibodies using the standard tube agglutination test (STAT), the buffered plate antigen test (BPAT), and the direct complement fixation test (CFT) as described by Forbes (4). For bacteriological studies of Brucella, each tissue was trimmed, flamed with absolute ethanol, and incised with sterile scissors before being double-bagged with an equal volume of 0.85% saline. The samples were then homogenized in a Colworth Stomacher Blender (A.J. Seward, Medical Division of UAC International Limited, 3 Cavendish Road, Bury St. Edmunds, Suffolk, England 1P33 3T3) and swabbed over the entire surface of two blood agar plates and four Brucella agar (5) plates with the following additives:

a. one plate of Brucella agar containing 25,000 I.U. of bacitracin, 6,000 I.U. of polymyxin B sulfate, and 100 mg of cyclohexamide per liter of serum tryptose agar basal medium.

b. one plate of Brucella agar containing the same antibiotics as (a) plus ethyl violet at a final concentration of 1:800,000.

c. one plate of Brucella agar containing 7,500 I.U. of bacitracin, 1,800 I.U. of polymyxin B sulfate, and 30 mg of cyclohexamide per liter of serum tryptose agar basal medium.

d. one plate of Brucella agar containing the same ingredients as (c) plus ethyl violet at a final concentration of 1:800,000.

The plates were incubated in 10% CO_2 at 37.5° C and examined daily for up to 10 days. Suspect colonies were identified to species and biovar using standard procedures (5). The identity of Brucella isolates was confirmed by the Animal Diseases Research Institute in Nepean, Ontario, and by the world reference center at the Central Veterinary Laboratory in Weybridge, England.

Tissues with gross or microscopic lesions suggestive of mycobacteriosis were submitted for mycobacteriological evaluation. The tissues were trimmed free of fat and connective tissue. One gram of tissue was mixed with 5.0 mL of a 15 M aqueous phosphate buffer (pH 7.0). The sample was then homogenized in a Ten Broek grinder (Fisher Scientific, 112 Colonnade Road, Nepean, Ontario K2E 7L6) and 5.0 mL of the resulting suspension were mixed with 10.0 mL of 2% NaOH containing phenol red indicator (0.1 g phenol red per 500 mL of 2% NaOH). The suspension was allowed to stand for a maximum of 12 min and was then neutralized with 2N HCl. Sterile distilled water was added to give a final volume of 35.0 mL, the sample was centrifuged at 1780 *g* for 30 min, and the supernatant discarded. The sediment was used to prepare a smear and to inoculate culture media. As a control, a duplicate sample of each tissue was treated the same way as the first sample but omitting the NaOH omitting the NaOH decontamination step.

Sediment smears were heat-fixed and stained by the Ziehl-Neelsen method, and 100 oil-immersion fields were examined for acid-fast bacilli. The decontaminated and non-decontaminated sediments were inoculated into one tube each of Middlebrook 7H-9 medium, Herrold egg yolk medium, Herrold egg yolk medium with 2.0 mg/L mycobactin, Lowenstein-Jensen medium, and Stonebrink medium. These were incubated at 37° C. Two additional tubes of Lowenstein-Jensen medium were inoculated: one was incubated at 30° C and the other at 42° C. The media were examined for up to 90 days. Suspect colonies were identified by morphological characteristics and standard biochemical tests (6).

Results

The complete or partial remains of 164 bison were found in and around WBNP between June, 1983, and October, 1985. Of these, 72 were suitable for disease analyses and 92 were unsuitable because they were too decomposed and/or too heavily scavenged. The sample had a broad geographical distribution, and included animals that had died outside the park boundary on the northeast, southwest, and southeast areas of the park (Fig. 2). The majority of the bison were necropsied during winter months when ground transportation was easiest (snowmobile), hunting and poaching activity were highest, and dead bison were most easily found because of lack of leaf cover and the ease of tracking hunters and poachers on snow.

The 72 animals included 23 bulls, 27 cows, 16 calves, two yearlings, and four adults of indeterminate sex. Nine of the 27 mature cows were pregnant in late fall and in winter. The sample was comprised of 44 bison killed by hunters, 12 bison killed by poachers, five bison killed by motor vehicles, four bison seen being killed by wolves, three debilitated bison shot by park wardens, two bison that died of diseases, and two bison that died of undetermined causes. The number of tissues collected from each bison varied between one and 14, with an average of 7.4.

Brucella abortus was isolated from the tissues of nine adult and two yearling bison. Positive BPAT results and high antibody titers on STAT (1:50 to 1:400, median 1:200) and CFT (1:5 to ≥1:50, median ≥1:50) were found in an additional seven adult bison from which the bacterium was not isolated. Sera obtained from five of the 11 culture-positive bison had high titers on STAT (1:400 to 1:3200, median 1:1600) and on CFT (≥1:50). None of the 16 calves was culture-positive, and sera obtained from four of these did not react on serological tests for brucellosis.

The isolates of *B. abortus* from the 11 bison included eight urease-positive strains of biovar 1, two urease-negative strains of biovar 1, and one strain of biovar 2. Isolates were obtained from one or more of the following tissues: retropharyngeal, submandibular, bronchial, hepatic, internal iliac, superficial inguinal, suprascapular, and precrural lymph nodes; liver, kidney, spleen, synovium, synovial fluid, and exudate from a subcutaneous abscess. The relative frequency of isolation of

B. abortus from each tissue, and the sensitivity and specificity of serological tests, could not be evaluated because of the small number of animals and because a complete collection of serum and tissues from each bison was not possible.

Lesions associated with B. abortus-infection (Figure 3) were seen in four bulls. One bull had a 5 cm diameter subcutaneous abscess on the posterior aspect of the left stifle joint; B. abortus biovar 1 was isolated from the suppurative exudate. Each of the three other bulls had one severely swollen stifle joint, and one of these also had a 29 cm long, 10 cm diameter hygroma on the cranial aspect of the left carpal and metacarpal region. Brucella abortus biovar 1 was isolated from all of these lesions. One of these bull had died of starvation secondary to severe arthritis.

Arthritis of the stifle joints was characterized grossly by loss of articular cartilage with eburnation or lysis of bone, synovial villus hypertrophy and pannus formation, thickening and distention of the joint capsule, and a large volume (200-1000 mL) of exudate. In two cases, the exudate was a translucent, viscous, yellow fluid containing small flecks of debris; it was found in the joint space and in distended tendon sheaths distal to the joint. In the third case, there was a thick, white, suppurative exudate within the joint space.

Two emaciated bison cows had identical lesions of serous arthritis involving stifle joints, but brucellae were not isolated from joint exudate. One of these cows had very high

Brucella antibody titers on STAT (1:400) and CFT (1:25); serum was not available from the other cow, and the hunter had removed part of the joint capsule while butchering the animal, leaving little exudate or tissue for bacteriologic examination. One cow was killed by a park warden because it was severely crippled and starving.

Histologically, animals with serous arthritis had large numbers of plasma cells and lymphocytes, and multifocal aggregates of hemosiderin-laden macrophages, within the synovium. There was marked proliferation of synovial villi and many of these were acellular and sclerotic. There were necrotic debris, but few inflammatory cells, on the synovial surface. There were foci of necrosis and mineralization within the synovium and joint capsule, and some of the deeper foci were large and surrounded by epithelioid cells, macrophages, lymphocytes, and fibroblasts. Giant cells were occasionally present in these granulomas. No consistent, attributable macroscopic or microscopic lesion was found in lymph nodes that were culture-positive for B. abortus.

Mycobacterium bovis was isolated from lesions in seven adult bison, and another seven adults and one calf had gross and microscopic lesions indicative of tuberculosis but were culture-negative. Other species of mycobacteria were not found. Both B. abortus and M. bovis were isolated from the tissues of two adult bison, and a third adult bison that reacted on STAT (1:50) and CFT (1:5) for brucellosis had advanced lesions typical of pulmonary tuberculosis but was culture-negative.

Tuberculous lesions (Figure 4) were confined to the lymph nodes in 10 of the 15 affected bison: five had lesions restricted to the lymph nodes of the head; two had lesions only in bronchial lymph nodes; one had lesions in bronchial and suprascapular lymph nodes; one had lesions in retropharyngeal, bronchial and mesenteric lymph nodes; one had lesions in one precrural lymph node. The other five bison had lymphoid and visceral lesions: two had pulmonary tuberculosis with involvement of bronchial and retropharyngeal lymph nodes; two had generalized tuberculosis involving thoracic and abdominal viscera (lungs, pleura, pericardium, ribs, liver, kidneys, testes, and epididymi), and multiple lymph nodes; one calf had granulomatous encephalitis (tuberculoma). In 14 of the 15 tuberculous bison, retropharyngeal and/or bronchial lymph nodes were consistently affected.

Isolates of *M. bovis* were obtained from lesions in retropharyngeal, bronchial, parotid, mandibular, mediastinal, mesenteric, renal, internal iliac, and superficial inguinal lymph nodes, and from lung and liver.

Histologically, tuberculosis in the lymph nodes and organs of bison was characterized by typical granulomas composed of macrophages, epithelioid cells, lymphocytes, and Langhans' giant cells, with variable amounts of caseation, mineralization, and fibrosis. Aggregates of neutrophils were occasionally present in these lesions but only rarely in large numbers. The granulomas could be seen individually or in confluent clusters. They ranged from microscopic, poorly delineated foci with little or no caseation and no fibrosis, to large caseous foci, and to highly mineralized fibrotic lesions. This range of lesions could be found within individual animals as well as among different animals. Complete regression and scarring of these lesions were not seen in any of the bison; those with highly mineralized, fibrotic lesions also had numerous foci of more acute granulomatous lesions.

Acid-fast bacilli were rarely seen in granulomatous lesions, even when the lesions were culture-positive. When found, the bacilli were in macrophages or giant cells surrounding caseous foci where there was little or no mineralization.

Bison with evidence of one or both diseases were widely distributed in the park and were also found outside the park (Figure 5). Of the 56 bison killed by native people, 15 (27%) had evidence of brucellosis and nine (16%) had lesions of tuberculosis. Three of the four bison seen being killed by wolves were severely debilitated by advanced lesions of tuberculosis; the fourth was an apparently healthy young calf. One bison cow had died of generalized tuberculosis and one bison bull died as a result of emaciation secondary to severe brucellar arthritis. Of the three disabled bison killed by park wardens, two had broken legs (trauma) and the other was incapacitated and starving because of severe arthritis; there was no evidence of brucellosis or tuberculosis in the first two bison, but the third animal, with serous arthritis of the left stifle, had very high antibody titers to Brucella on STAT (1:400) and CFT (1:25). Three of the five bison killed by motor vehicles were healthy and the other two had small tuberculous lesions in retropharyngeal and bronchial lymph nodes. The three bison with advanced tuberculosis and two bison with severe debilitating brucellar arthritis were emaciated, but the other 67 bison in the sample were in good body condition, based on subcutaneous and internal fat deposits, regardless of the season in which they were killed.

Discussion

Acquisition and quality of samples were good considering the inherent limitations of an opportunistic collection, the great size of the study area, and the logistical difficulties of retrieving samples. The 164 bison found dead in the study did not reflect total mortality in the population during that period: as many as 372 dead bison were reported in conversations with hunters, trappers and wildlife personnel, but many of these reports could not be verified because of inadequate descriptions of the location of carcasses.

Of the 72 bison necropsied, 18 (25%) had evidence of brucellosis and 15 (21%) had evidence of tuberculosis, with a combined prevalence of 42%. This is likely a conservative estimate of the prevalence of the diseases in the sample because some carcasses yielded few tissues for analyses.

The sample was essentially a hunting survey, since 78% of the bison were collected by hunters and poachers. Hunters preferred younger bison that were in good body condition, a process of selection that biased against finding diseased animals. Because of many years of poor production and recruitment of calves (7), the age distribution of the population of bison in the park region is likely skewed towards an older mean age, whereas the harvest by hunters was biased in favor of younger animals. Consequently, the hunter-killed portion of the sample likely under-estimated the prevalence of the diseases in the general population.

The small portion of the bison in the sample that were killed by vehicles, dispatched by park wardens, or which died of indeterminate causes was not obviously biased in relation to disease. Despite the small sample size, the results suggested a correlation between predation by wolves and advanced tuberculosis. The diseases predispose bison to predation, and this should be taken into account when considering proportional mortality due to wolves. The availability of large numbers of debilitated, diseased bison may artificially maintain a large population of wolves which, in turn, likely exacerbates the problem of poor recruitment of calves into the bison population.

Based on this survey, the 95% confidence intervals taken from binomial distribution tables (8) indicated that the prevalence of brucellosis in the bison population was 16-37% and that the prevalence of tuberculosis was 12-32%, with a combined prevalence of 31-55%. These results compared well with prevalence values obtained from bison that were driven into corrals and slaughtered in the park between 1959 and 1967: 27.4% of 1,789 bison were positive on brucellosis agglutination tests and 42.4% of 1,090 bison had lesions of tuberculosis (3).

One bison died of tuberculosis and three others would have died of the disease if wolves had not intervened; one bison died of starvation, and another was dispatched because of starvation, both secondary to severe brucellar arthritis. Thus the deaths of six (8%) bison in the sample could be attributed to the two diseases. This observation concurs with a previous estimate of 4-6% mortality based on finding generalized tuberculosis, and 2% prevalence of arthritis, in adult bison commercially slaughtered in the park during the 1950's (9).

Brucella abortus was isolated from a wide range of lymphoid tissues from bison, similar to the distribution of the pathogen in infected cattle (10-14). Because of this wide range of potentially infected tissues, a broad collection of samples should be done in order to find the bacterium in bison. The arthritis and hygromas associated with brucellosis in bison were similar to those reported in cattle (10,15-18). These lesions caused marked lameness and contributed to the emaciated condition of affected bison. A quantitative assessment of the contribution of brucellosis to the poor calf production in the park bison (7,9) was not possible from an opportunistic study of this kind.

The biovars of *B. abortus* isolated from bison were similar to field strains reported in cattle, and no strain that could be considered unique to bison was found. Urease-positive strains of biovar 1 were the most common isolates when brucellosis occurred in cattle in Canada (Forbes, unpublished). Biovar 2 has been detected only once in cattle in Canada (19) and has been found in a small percentage of infected cattle in the USA (20). Urease-negative strains of biovar 1 have never been reported in cattle in Canada, but have been found occasionally in cattle from a variety of other countries (21). The inability to split urea is a stable characteristic of Strain 544, the type strain of *B. abortus* (22). The rarity of biovar 2 and urease-negative strains of biovar 1 in cattle in Canada and the US makes them widely useful epidemiological markers for tracking brucellosis; identification of urease-positive strains of biovar 1 is also useful, but on a more localized basis.

All strains of *B. abortus* isolated from bison and elk in the USA have been biovar 1 (23,24). The presence of additional strains of *B. abortus* in bison in the WBNP region suggests that the bison were historically exposed to more than one source of infection.

The distribution and characteristics of lesions of bovine tuberculosis in bison were the same as those described in cattle (25-30). As in cattle (29), alimentary and aerogenous infection both would produce lesions in the lymph nodes of the head of bison. The greater number of bison that had tuberculous lesions in bronchial lymph nodes and lungs, compared to the few bison with lesions in abdominal lymph nodes and viscera, may suggest that the respiratory tract is the more important route of infection in adult bison.

Of the 56 bison that were killed and butchered for human consumption by hunters and poachers in the park region, 15 had brucellosis and nine had tuberculosis. Hunters did not wear gloves or take any other special precautions when processing dead bison. They were seen puncturing hygromas and arthritic joints, opening subcutaneous abscesses, incising caseous retropharyngeal lymph nodes, and contaminating their hands and knives, and the meat. Brucella abortus and M. bovis were subsequently isolated from these lesions. There is obvious potential for human infection.

The broad geographical distribution of bison with brucellosis and/or tuberculosis indicated that the diseases are enzootic in the population. This was not unexpected given the wide-ranging movements and gregarious behavior of bison, and the chronic, highly infectious nature of these diseases. During this survey, bison were seen up to 75 km outside the southwest corner of WBNP. Gainer (31) has documented sporadic sightings of bison in and near the agricultural zone of Fort Vermilion, Alberta. The high prevalence of brucellosis and tuberculosis in these bison, the distances over which they roam, and the increasing proximity of livestock and other bison populations present a growing risk of the spread of the diseases to uninfected herds of bison and cattle.

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Acknowledgments

We thank the Canadian Parks Service and the Northwest Territories Department of Renewable Resources for their support of this research. We acknowledge funding from Agriculture Canada and a Northern Field Research Grant to S.V. Tessaro. Dr. Gary A. Wobeser provided encouragement and constructive criticism throughout the project. Mr. Ed Bueckert and Mr. Ian Shirley were responsible for preparation of the histological slides and photographic material.

References

1. Choquette LPE, Gallivan JF, Byrnes JL, Pilipavicius J. Parasites and diseases of bison in Canada. I. Tuberculosis and some other pathological conditions in bison at Wood Buffalo and Elk Island National Parks in the fall and winter of 1959-69. Can Vet J 1961; 2: 168-174.
2. Choquette LPE, Broughton E, Cousineau JG, Novakowski NS. Parasites and diseases of bison in Canada. IV. Serologic survey for brucellosis in bison in northern Canada. J Wildl Dis 1978; 14: 329-332.
3. Broughton E. Diseases affecting bison. In: Reynolds HW, Hawley AWL, eds. Bison ecology in relation to agricultural development in the Slave River lowlands, N.W.T. Can Wildl Serv Occ Paper 1987; 63:34-38.
4. Forbes LB. The eradication of bovine brucellosis: an effective sample acquisition protocol for a low incidence area. Proc Am Assoc Vet Lab Diagnost, 1980: 195-216.
5. Alton GG, Jones LM, Pietz DE. Laboratory techniques in brucellosis. 2nd ed. Geneva: World Health Organization, 1975.
6. U.S. National Veterinary Services Laboratory. Laboratory methods in veterinary mycobacteriology. Revised edition. Ames, Iowa: U.S. National Veterinary Services Laboratory, 1985.
7. Tessaro SV. A descriptive and epizootiologic study of brucellosis and tuberculosis in bison in northern Canada.

PhD thesis, University of Saskatchewan, 1988.

8. Diem K, Lentner C, eds. Documenta Geigy. Scientific tables. 7th ed. Basel: J. R. Geigy, 1970: 85-98.
9. Fuller WA. Biology and management of the bison of Wood Buffalo National Park. Can Wildl Ser Wildl Manage Bull Ser 1, No 16, 1962.
10. Doyle TM. The distribution of *Brucella abortus* in the system of "carrier" cows. J Comp Pathol 1935; 48: 192-217.
11. Fitch CP, Boyd WL, Bishop LM. A study of the vaginal content of pregnant Bang-infected cows for the presence of *Brucella abortus*. J Am Vet Med Assoc 1938; 92: 171-177.
12. Washko FV, Donham CR, Hutchings LM, Heimlich A. Recovery of *Brucella* from tissues of cattle exposed to *Brucella abortus*. J Am Vet Med Assoc 1952; 120: 82-84.
13. Lambert G, Amerault TE, Manthei CA, Goode ER. Further studies on the persistance of *Brucella abortus* infections in cattle. Proc US Livest Sanit Assoc 1960; 64: 109-117.
14. Forbes LB. Bacteriological, serological and epidemiological studies of *Brucella abortus* in cattle. MSc thesis, University of Saskatchewan, 1983.
15. Mullen AL. Pathological conditions of the bovine joint as a clinical manifestation of Bang's disease. Vet Rec 1932; 12: 1449-1455.
16. Lowbeer L. Skeletal and articular involvement in brucellosis of animals. Lab Invest 1959; 8: 1448-1455.
17. Fensterbank R. Congenital brucellosis in cattle associated

with localization in a hygroma. Vet Rec 1978; 103: 283-284.

18. Jubb KVF, Kennedy PC, Palmer N. Pathology of domestic animals, 3rd ed vol 3. Toronto: Academic Press, 1985: 346-347.

19. Forbes LB, Steele TB. An outbreak of Brucella abortus biovar 2 in Canadian cattle. Can Vet J 1989; 30: 888-893.

20. Harrington R, Brown GM. Laboratory summary of Brucella isolations and typing. Am J Vet Res 1976; 37: 1241-1242.

21. Corbel JM, Hendry DMFD. Urease activity of Brucella species. Res Vet Sci 1985; 38: 252-253.

22. Meyer ME, Brinley-Morgan WJ. Designation of neotype strains and of biotype reference strains for species of the genus Brucella (Meyer and Shaw). Int J Syst Bacteriol 1973; 23: 135-141.

23. Thorne ET, Morton JK, Ray WC. Brucellosis, its effect and impact on elk in western Wyoming. In: Boyce M, Hayden-Wing L, eds. North American elk: ecology, behavior and management. Laramie: University of Wyoming, 1979: 212-220.

24. Luchsinger DW, Ewalt DR, Harrington R. Brucellosis: an isolation and typing laboratory summary. Fiscal years 1977-1979. Ames: United States Department of Agriculture, National Veterinary Service Laboratory, 1980.

25. Stamp JT. A review of the pathogenesis and pathology of bovine tuberculosis with special reference to potential problems. Vet Rec 1944; 56: 443-446.

26. Stamp JT, Wilson A. Some aspects of the pathogenesis of

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bovine tuberculosis based on abattoir returns. Vet Rec 1946; 58: 11-15.

27. McKay WM. A clinical study of bovine tuberculosis in Banffshire. The pathological lesions, parts I and II. Brit Vet J 1959; 115: 324-329, 370-377.

28. Lepper AWD, Pearson CW. The route of infection in tuberculosis of beef cattle. Aust Vet J 1973; 49: 266-267.

29. Dungworth DL. The respiratory system. In: Jubb KVF, Kennedy PC, Palmer N, eds. Pathology of domestic animals, 3rd ed vol 2. Toronto: Academic Press, 1985: 493-504.

30. Thoen CO, Himes EM. Pathogenesis of Mycobacterium bovis infection. In: Pandy R, ed. Veterinary microbiology: molecular and clinical perspectives. Prog Vet Microbiol Immunol 1986; 2: 198-214.

31. Gainer R. Free-roaming bison in northern Canada. Alta Nat 1985; 15: 86-87.

Figure 1. Map showing the location of Wood Buffalo National Park. Broken lines and circled numbers represent highways and highway numbers.

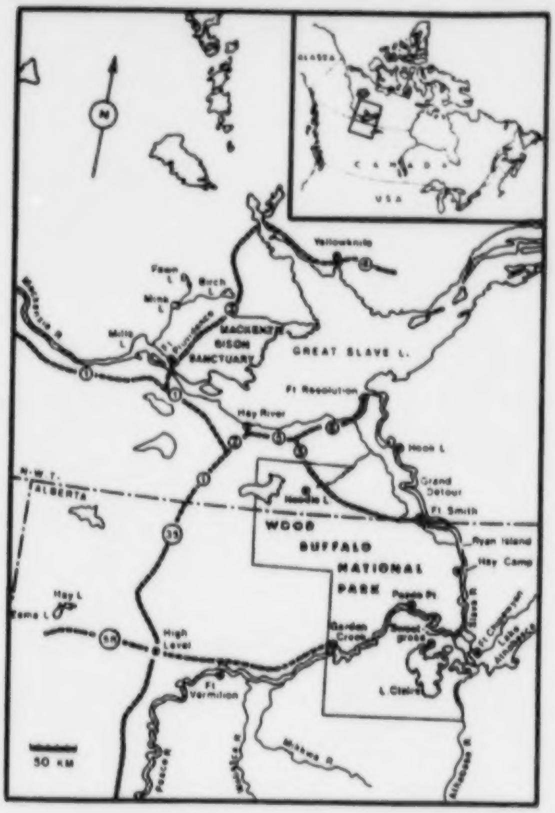
Figure 2. Map of Wood Buffalo National Park showing the location of bison carcasses. Solid circles represent locations where carcasses suitable for sampling were found; open circles indicate sites where carcasses were found but were too decomposed or too scavenged-upon for diagnosis of disease. Numbers are provided where more than one dead bison was found at a given location.

Figure 3. Articular lesions of bison from which Brucella abortus was isolated. a. Swollen left stifle joint (arrows) of a bison with serous arthritis. b. Suppurative arthritis of the left stifle joint (arrow). c. Serous exudate (frozen in situ) within the distended capsule of a stifle joint (arrow). d. Eburnation, bone lysis (arrow) and osteophytes (ost) on the distal articular portion of the left femur of a bison with brucellar arthritis.

Figure 4. Lesions associated with Mycobacterium bovis infection in bison. a. Multiple caseous granulomas in a mediastinal lymph node. b. Cross-section of left caudal lobe of the lung of a bison that died of advanced pulmonary tuberculosis. c. Granulomatous lymphadenitis in a retropharyngeal lymph node; only a thin rim of lymphoid tissue remains around the central area of

partially mineralized, caseous necrosis. d. Granulomatous pericarditis with adhesions between the pericardial sac (ps) and the epicardial surface of the left auricle (la). e. Multiple caseating granulomas (arrows) in a cross-section of liver. f. Focal granulomatous encephalitis (arrows) in the left cerebral hemisphere of a bison calf.

Figure 5. Map of Wood Buffalo National Park showing the locations of bison with bovine brucellosis (circles) and tuberculosis (triangles). Numbers are provided where more than one infected animal was found at the same site.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GREAT SLAVE L.
Ft Resolution
Hay River
Hook L
Grand Detour
N.W.T.
ALBERTA
Ft Smith
Ryan Island
Hay Camp
WOOD BUFFALO NATIONAL PARK
Peace Pt
Slave R
Ft Chipewyan
Lake Athabasca
Garden Creek
Sweetgrass
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Figure 1.

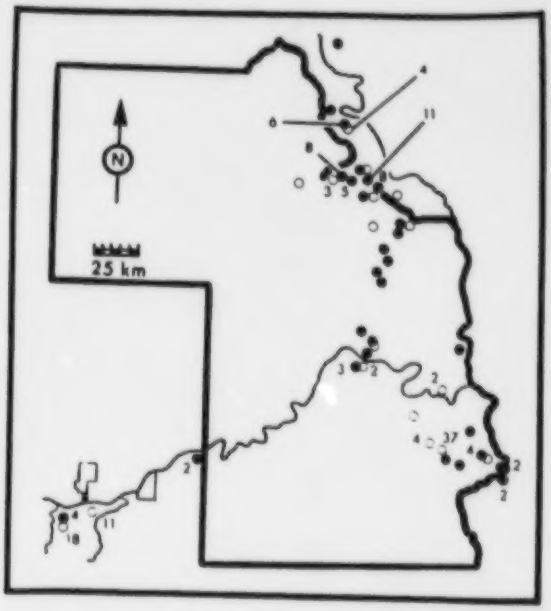
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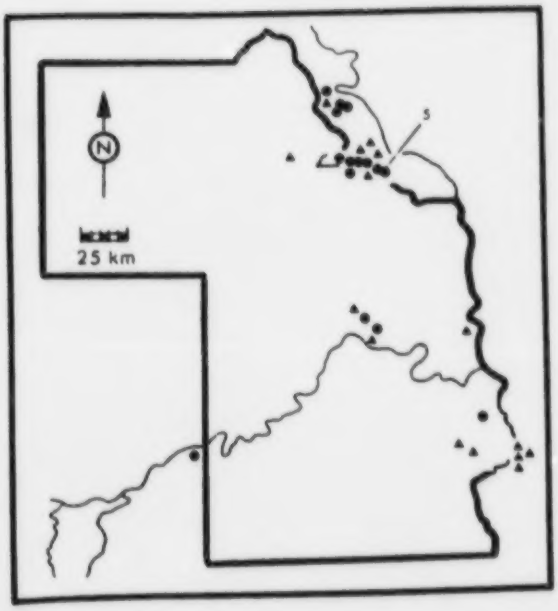
Figure 2.



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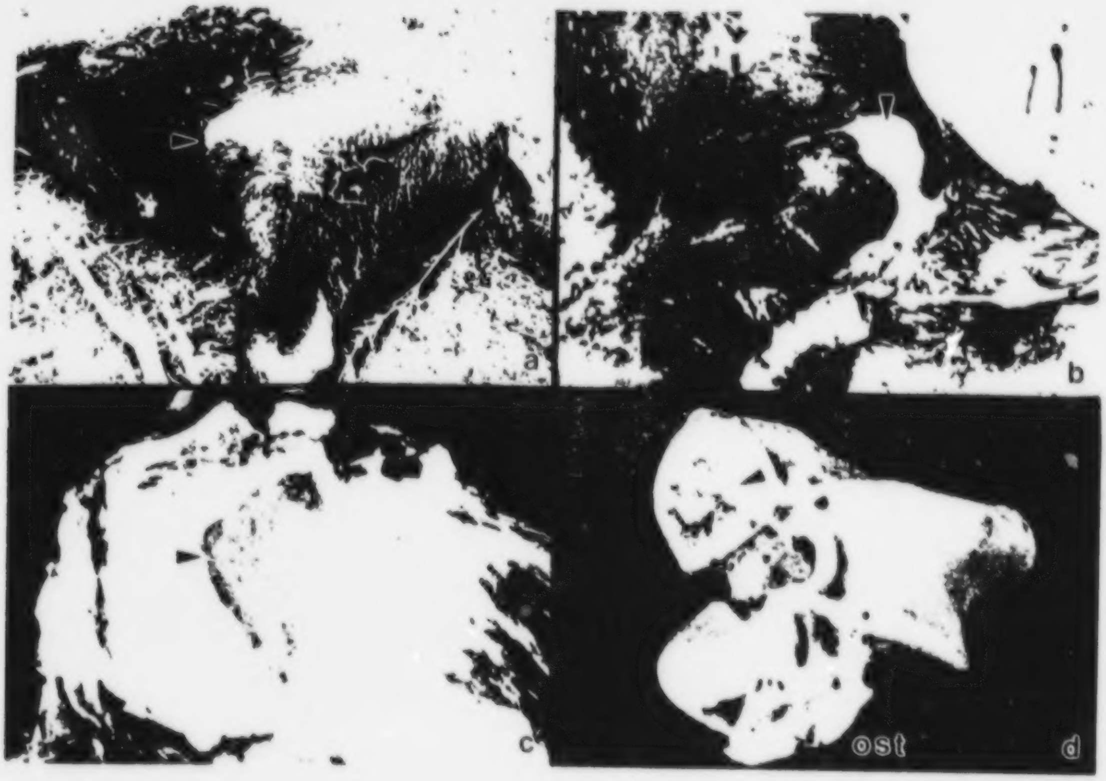

Figure 3.

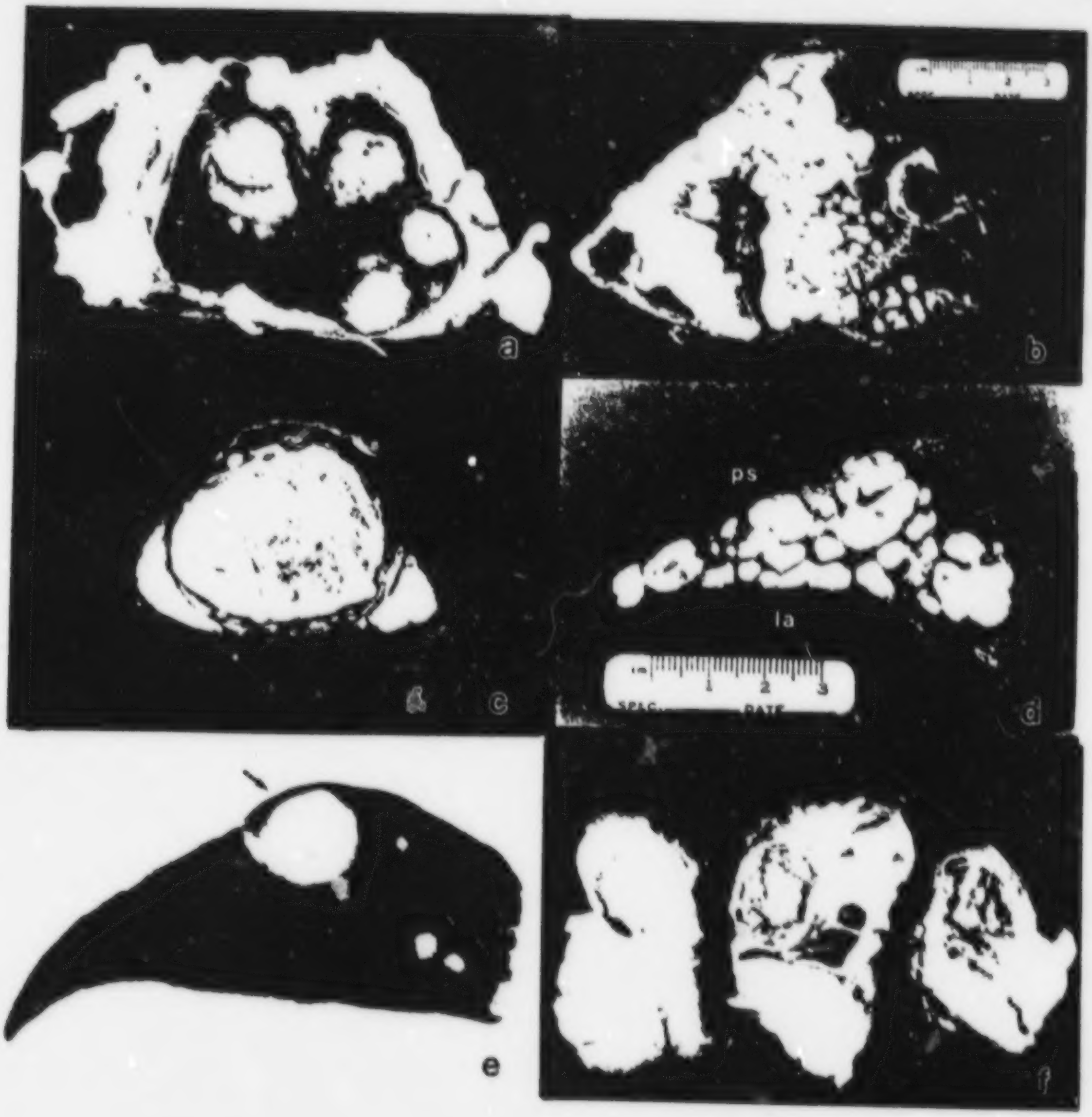
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Figure 4.

DISEASED BISON STATISTICS

DEATHS FROM TUBERCULOSIS: 5.5% (Tessaro)

4 - 6% (Fuller)

CRIPPLING FROM ARTHRITIS: 6 - 8% (Tessaro)

2% (Fuller)

CALF PRODUCTION: 22 calves/100 cows (Tessaro)

21 calves/100 cows (NWT)

22-32 calves/100 cows (Parks)

YEARLING SURVIVAL: 9-11 yearlings/100 cows (Tessaro)

11 yearlings/100 cows (NWT)

4-21 yearlings/100 cows (Parks)

53 Keane
Ft Chip
Jan 22, 1990

SUBMISSION BY LAWRENCE J. VERMILLION:

TRAPPER IN WOOD BUFFALO NATIONAL PARK
AREA 1209.

RE: "BISON"

THIS IS MY 12th HOUR SUBMISSION TO THE PANEL WHOM I KNOW WILL TAKE IT TO THE MINISTERS.

THE GOVERNMENT CONTINUALLY APPROACHES THE COMMUNITIES FOR THEIR INPUT AND FEEDBACK ON ISSUES SUCH AS THIS (BISONS) AT THE LAST MINUTE.

I AM AWARE THAT THE GOVERNMENT IS USING THESE TACTICS JUST TO MAKE THEMSELVES LOOK GOOD AND TO ACCOUNT FOR THE TAX PAYERS DOLLARS.

WELL! I KNOW THAT YOUR PLANS ARE TO SLAUGHTER THE BISON.

FIRST OF ALL THE GOVERNMENT SHOULD INSURE THAT AT LEAST TWO HUNDRED DISEASE FREE BISONS, 150 FEMALES AND 50 MALES BE ROUNDED UP AND PROTECTED IN A LARGE CORAL FOR THEM TO ROAM IN JUST OUTSIDE THE PARK IN A CLEAN DISEASE FREE ENVIRONMENT, CREE BAND MEMBERS SHOULD BE HIRED TO DO THE ROUND-UP AS PER LAND CLAIM AGREEMENT.

THEREFORE I PROPOSE TO ORGANIZE A GROUP OF BUFFALO HUNTERS MADE UP OF ONLY CREE BAND MEMBERS SINCE OUR LAND CLAIM AGREEMENT INVOLVES HUNTING AND TRAPPING RIGHTS IN THE WOOD BUFFALO NATIONAL PARK AREA / FIRST RIGHT OF REFUSAL.

OUR FOREFATHERS HAVE BEEN KNOWN NEVER TO WASTE ANY PART OF AN ANMAL. AS A RESULT I PROPOSE TO DO THE FOLLOWING WITH THE CARCASSES:

(1) THE BUFFALO HEADS WILL BE SOLD AS THROPHYS TO THE MINISTERS, AGRICULTURE CANADA, CATTLE FARMERS AND ANYONE ELSE WHO WANDED THE BISONS DESTROYED AT A REASONABLE COST.

(2) THE BUFFALO HIDES WILL BE TANNED AND SOLD AT PROFITABLE PRICES TO ANYONE.

(3) THE DISEASE FREE ANIMAL MEAT WILL BE DISTRIBUTED TO THE COMMUNITY PEOPLE FOR THEIR OWN USE FREE OF CHARGE.

(4) THE DISEASED ANIMALS CARCASSES WILL BE GIVEN TO COMMUNITY MEMBERS FOR DOG FOOD

(5) THE LEGS AND HOFFS CAN BE SOLD AS SOUVINERS MADE INTO LAMP STANDS COFFEE TABLE LEGS ETC ... .

IN CLOSING I WOULD LIKE TO POINT OUT TO YOU THAT NO ONE WILL BE ALLOWED IN THE PARK OTHER THAN CREE BAND BUFFALO HUNTERS DURING THE SLAUGHTER.

I ALSO BELIEVE THAT THIS IS A VERY FAIR AND SOUND REQUEST MADE BY MYSELF ON BEHALF OF THE CREE BAND BUFFALO HUNTERS FOR A VIABLE BUSINESS HISTORICAL VENTURE.

I HAVE THE FIRST RIGHT OF REFUSAL AS PER OUR LAND CLAIM AGREEMENT TO BE AWARDED THIS SPECIAL REQUEST.

CANADIAN NATURE FEDERATION
FÉDÉRATION CANADIENNE DE LA NATURE

453 Sussex Drive, Ottawa, Ontario K1N 6Z4 (613) 238-6154

Received
Jan 25 1990
Edmonton

THE FUTURE OF BISON
IN
WOOD BUFFALO NATIONAL PARK

presented to
The Northern Diseased Bison Environmental Assessment Panel

January 25, 1990

by
B.Theresa Aniskowicz, Ph.D.
Co-ordinator of Conservation Programs

EXECUTIVE SUMMARY

The bison in Wood Buffalo National Park (WBNP) are hybrids between wood and plains bison, and 30-50 percent of the herd is infected with brucellosis, tuberculosis, or both diseases. There is fear that the diseases will spread to cattle and people, and that genetic and disease contamination of the wood bison in the Mackenzie Bison Sanctuary (MBS) will occur. To solve these problems, Agriculture Canada proposes to eradicate all 4,000-5,000 animals now present in WBNP and to replace them with disease-free wood bison.

Although the potential for transmittal of disease from bison to people and cattle exists, there is no documented case of such disease contamination having occurred under field conditions. Moreover, risks can be eliminated if proper precautions are taken.

It is possible that if the WBNP herd is allowed to continue, it will be able to coexist indefinitely with brucellosis and tuberculosis. Until it becomes clear whether this can happen, every measure possible should be taken to prevent contact between the WBNP and MBS herds.

The Canadian Nature Federation (CNF) opposes the elimination of the largest bison gene pool now in existence in order to save the very limited gene pool contained in the wood bison of the MBS, which, quite likely, are themselves hybrids. Moreover, there is no guarantee that eradication of the WBNP herd will be complete and that the reintroduced wood bison will not, once again, become infected. Further, implementation of the eradication process will cause unacceptable damage to the park and to its ecology. It will set a dangerous precedent for interests outside parks to shape events within park boundaries, a serious blow to the autonomy of national parks and to their ability to carry out their mandate.

The CNF considers it important that the integrity of WBNP be maintained. We recommend that no slaughter of bison take place and that the park and its surroundings be managed as an ecosystem, with cattle excluded from a zone around the park. We also recommend that the current bison-free zone between the WBNP and MBS herds be maintained in the short term and that research to develop an effective vaccine for bison be accelerated.

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INTRODUCTION

The relationship between North American bison and pioneers was fraught with problems almost from the time the two came into contact. White hunters considered the herds to be limitless and killed bison by the hundreds, often leaving the carcasses to rot on the prairies. The encroachment of civilization, with the accompanying use of land for agricultural purposes, caused bison range to dwindle. In less than a century, this combination of factors drove the bison, which once numbered 50-60 million animals, to the brink of extinction. Agriculture, particularly in the United States, continues to play an important role in the prevention of herd expansion (Thorne et al, 1989).

Once it was realized that the bison were about to be lost, efforts were made to save the species. Among them, Wood Buffalo National Park (WBNP) was set aside to protect the last herd of wood bison, which numbered 1,500-2,000 animals (Wershler and Wallis, 1989; Bison Disease Task Force, no date; Canadian Wildlife Service, 1989). In an effort to increase the numbers, 6,673 plains bison were moved to the park from 1925 to 1928 (Bison Disease Task Force, no date; Canadian Wildlife Service, 1989). This gave rise to the two problems we face today: hybridization between two subspecies and introduction of bovine brucellosis and tuberculosis.

With protection, the WBNP herd increased rapidly to an estimated 12,000 individuals in the 1930s and remained in the 12,000-14,000 range into the 1950s (Anonymous, 1989) and presumably in the 1960s (Messier, 1989; Carbyn and Trottier, 1988). Subsequently, the population began to decline (Messier, 1989) and now the park contains between 4,000 and 5,000 bison. This decline was due in part to the drowning of approximately 10,000 animals in spring floods during the period 1957-1967 and some 3,000 additional animals drowned in 1974 (Anonymous, 1989). Approximately 6,000 bison were slaughtered, mostly for meat, between 1929 and 1977 (Anonymous, 1989; Messier, 1989) and anthrax outbreaks were responsible for a loss of approximately 1,600 animals between 1962 and 1978 (Broughton, 1987). It became evident that, in addition to these factors, brucellosis, tuberculosis and wolves were contributing to the decline (Bison Disease Task Force, no date). Two well-meaning but inappropriate programs were initiated: disease eradication and wolf control.

The bison were treated in much the same way that a diseased herd of domestic cattle was treated in the 1960s and 1970s. Bison were rounded up, corralled, and tested for anthrax, brucellosis

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and tuberculosis. Those that tested positive were slaughtered, and the apparently healthy animals were vaccinated against anthrax and released. This procedure proved to be a traumatic experience for the wild animals, some of which died during handling (Bison Disease Task Force, no date), and it did little to stop the diseases (at present, 35 to 50 percent of the bison are infected with brucellosis, tuberculosis, or both).

The wolf-control program did a great deal of harm. It was not realized that wolves generally cull out the most disease-weakened animals, a natural selection process that leads to the survival of the healthiest animals. Instead, perfectly healthy wolves were killed to allow diseased bison to live longer, thereby providing more opportunity for diseased animals to infect greater numbers of healthy individuals. Fortunately, this program was eventually stopped and WBNP now supports a substantial wolf population (Carbyn and Trottier, 1989; Messier, 1989).

In the 1950s it was believed that no pure wood bison were left, i.e., all bison in WBNP were hybrids. However, in 1958 a herd of 200 apparently pure wood bison were discovered in the remote northern part of the park (Novakowski, 1977). Upon closer examination, they proved to possess the typical phenotypic characteristics of wood bison and many of the animals in the herd were free of disease. Twenty-three of these animals were taken to start a herd in Elk Island National Park (EINP) and 18 others were moved to the Mackenzie Bison Sanctuary (MBS) (Novakowski, 1977) north of WBNP. The latter became the parents of what is now a herd of over 2,000 disease-free and presumably genetically pure wood bison. This costly recovery effort has succeeded so far in re-establishing the wood bison, and the MBS herd is still growing and expanding its range southward. It is likely to contact the WBNP herd in the near future. To prevent such contact, a bison-free zone is being maintained between the two herds by killing all bison of whatever origin in the area (Canadian Wildlife Service, 1989).

In the meantime, agricultural interests have moved progressively closer to WBNP. The Canadian cattle herd was certified brucellosis-free in 1985 and it was hoped that it would attain tuberculosis-free status by the end of 1989 (Bison Disease Task Force, no date). The bison in WBNP are therefore the last large reservoir of bovine brucellosis and tuberculosis in the country.

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THE PROBLEM

The diseased hybrids of WBNP are perceived as a problem for several reasons:

1. There is fear that cattle will contract brucellosis and tuberculosis from the WBNP bison which range outside park boundaries during part of the year. This might result in Canada losing its brucellosis-free certification and never attaining tuberculosis-free status, a situation which would have serious negative economic impacts on the agricultural industry (Bison Disease Task Force, no date; Agriculture Canada, 1989a, b).

2. There is concern that the WBNP herd poses a human health risk, particularly to native people who hunt the bison outside park boundaries. They are not always aware that killed animals may be diseased and therefore may not take the necessary precautions to safeguard against contracting the diseases themselves (Agriculture Canada, 1989b).

3. The MBS herd is expanding so rapidly that there is a very real danger that the healthy MBS herd will contact the diseased hybrids at any time (Canadian Wildlife Service, 1989). Should this happen, genetic and disease contamination of the MBS herd is likely to occur simultaneously. Furthermore, no attempts will be made to establish new herds of wood bison while the WBNP herd continues to exist and roam outside park boundaries. Prevention of MBS herd expansion is viewed as a serious curtailment of the wood bison recovery effort and the goal of removing the subspecies from the COSEWIC list. Genetic and disease contamination of the MBS herd is perceived as a serious setback for, if not the undoing of, the wood bison recovery effort.

The WBNP bison issue is an extremely complex one, as evidenced by the fact that FEARO set up the Northern Diseased Bison Environmental Assessment Panel, and that a very considerable amount of time and effort have been put into evaluating various options which have been proposed to solve the problem. Agriculture Canada presents the issue as a clear-cut case (Agriculture Canada, 1989b), which it is not. On the contrary, Agriculture Canada's recommended eradication-replacement solution is far too simplistic. With the luxury of hindsight, many past bison-management decisions are now regarded as regrettable. It is of paramount importance that decisions made this time not become regrettable as well.

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GENERIC CONSIDERATIONS

Although plains and wood bison are generally treated as subspecies, expert taxonomists cannot agree on their exact status. They concur that all bison belong to the species *Bison bison*, but they have not reached a consensus about whether subdivision into subspecies is justified.

Studies of craniometric and other morphological characteristics show that there are two forms of North American bison, each with specific phenotypic characteristics (van Zyll de Jong, 1986). On the basis of this information, some taxonomists support subspecific status designation for the two forms: plains bison (*B. b. bison*) and wood bison (*B. b. athabascae*). However, what are now considered pure wood bison are, quite likely, themselves hybrids, a conclusion supported by Berg (1989). The wood bison were isolated from the WBNP herd in 1963 (Bison Disease Task Force, no date), after some 35 years of unrestricted interbreeding between plains and wood bison. Some of these supposedly pure wood bison tested positive for brucellosis and tuberculosis (Bison Disease Task Force, no date), providing further evidence that contact with the remainder of the hybrids in WBNP had occurred.

Studies of the blood characteristics (Peden and Kraay, 1979) and genetics (Bork *et al*, no date) of plains and wood bison confirm that there are, indeed, two forms but indicate that the differences are too minor to warrant separate subspecific status. Chemical studies performed thus far on the genes of separate populations of plains and wood bison in Elk Island National Park (EINP) demonstrate a high degree of similarity between the two groups (Bork *et al*, no date). They show that consistent minor differences exist, but that there are many more similarities than there are differences. The differentiation is of the order found in geographically isolated populations of a species. Various other attempts to find genetic markers have not resulted in discovery of subspecies uniqueness (Berg, 1989). Therefore, subdivision into subspecies is debatable.

Some scientists consider this work as only preliminary and believe that additional studies will demonstrate the validity of subspecific status (Canadian Wildlife Service, 1989; Bork *et al*, 1989). Observations of bison, however, support the findings obtained thus far by chemical genetics. As a general rule, at least partial reproductive isolation occurs between subspecies; reduced fitness of progeny is the usual consequence. This does not apply to plains and wood bison as they interbreed freely and

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the resultant hybrids show no reduction in fitness or reproductive ability. On the basis of this information, wood and plains bison do not warrant subspecific status but represent geographical variants within a species.

The true taxonomic status of the bison remains unclear. However, it is quite evident that the two forms are genetically similar and have separated only recently on the evolutionary scale. This is confirmed by estimates that, whereas American and European bison split up some 10,000 years ago, plains and wood bison split off some 5,000 years later (Wilson, 1969 in Bork et al, no date).

When placing the wood bison on the endangered species list in 1978, COSEWIC (Committee on the Status of Endangered Wildlife in Canada) followed the taxonomy in use at the time. This has no bearing on the taxonomic status of the animals, particularly as COSEWIC frequently lists populations which are in some way distinct but are known to belong to one species. For example, two years ago the committee deliberated on the designation of various beluga stocks which inhabit the James and Hudson bays and intermingle during part of the year. This reflects the importance COSEWIC places on distinct populations and the need to preserve such genetic diversity, but it makes no decisions on taxonomic status.

Another important genetic consideration is the question of genetic diversity and the size of the gene pools in the various bison herds now in existence.

The MBS herd now numbers over 2,000 animals, all of them the progeny of 18 individuals (Novakowski, 1977). The two herds at EINP originated from 22 wood bison and 30 plains bison (Bork et al, no date). Most other "pure" animals are the progeny of these herds and all originate from very limited stock. Thus, all existing "pure" bison have passed through very narrow genetic bottlenecks and have undergone extensive inbreeding. They now contain very limited genetic diversity, as confirmed by chemical studies of the genetics of the EINP herd (Bork et al, no date). Consequently, mixing of existing "pure" stocks would result in little improvement of the gene pool. Moreover, present representatives of wood and plains bison do not exhibit the genetic diversity that existed in the large herds before they were driven to the brink of extinction.

The WBNP herd, by contrast, numbered some 1,500 indigenous wood bison in 1925. Although their genes have been mixed with those of plains bison, they still contain the largest and most diverse reservoir not only of wood bison genes but of all bison genes. The Bison Disease Task Force (no date) concluded that "the bison from the park and surrounding area have the broadest genetic base of any bison population in the world."

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With regard to the future of the WBNP herd, a very important question must be considered:

- Given the very close taxonomic relationship between wood and plains bison, does the preservation of the MBS bison (with its very limited and impoverished gene pool) take precedence over the preservation of the largest bison gene pool now in existence?

The position of the Canadian Nature Federation (CNF) is that, although maintenance of whatever genetic purity still exists is desirable, the preservation of the large gene pool contained in the WBNP herd is far more important because of the small gene pools in other bison herds and the only minor genetic differences between wood and plains bison. It makes no sense to destroy the largest bison gene pool in existence to save a very limited one.

DISEASE CONSIDERATIONS

Cattle

Both tuberculosis and brucellosis now present in the WBNP herd were probably introduced into North America by cattle. Agriculture Canada is very concerned about the transmission of these diseases back to cattle, which would undoubtedly be a serious and expensive problem for the cattle industry, albeit one the industry has lived with for many decades. Although it is not the Canadian Nature Federation's mandate to deal with the implications of disease for industry, we would like to make some observations, particularly where wildlife is involved.

For many years cattle have been grazing in the proximity of Yellowstone National Park in the United States in areas where brucellosis-infected bison regularly wander outside park boundaries. Despite that, there is no documented case of cattle contracting brucellosis under field conditions from the park bison (Thorne et al, 1989; Meagher, 1989; Schullery, 1986). Dr. Tessaro of Agriculture Canada claimed, on "The Journal" (CBC, January 16, 1990) that there were three cases of brucellosis transmittal from bison to cattle, but wildlife specialists at Yellowstone state that this is incorrect (Wallis, personal communication).

Neither is there a documented case of cattle contracting diseases from the WBNP bison (Stevenson, 1989). There is only the potential of transmission, and this potential is being played up

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to its maximum because the industry wishes to expand into the area surrounding the park. The fact is, if cattle are kept out of bison range, they will not be exposed to the diseases. By taking for granted that agriculture must expand into the area near WBNP and that this area must be made safe for cattle, industry and Agriculture Canada are simply claiming that their interests take precedence over all others, a position the CNF does not accept.

Eradication of bison to eliminate the potential spread of disease to cattle would set a dangerous precedent. Brucellosis has been found in moose, elk, wolves and foxes (Agriculture Canada, 1989b; Thorne et al, 1989) and could conceivably be transmitted to cattle by these animals. Bighorn sheep and deer carry various other diseases that can be transmitted to livestock. There could also be a call for the eradication of these species in specific areas if a problem is perceived.

If the industry insists on bringing cattle into an area where a disease has existed for over 60 years, not only in bison but in moose, foxes and wolves, it must take precautions to prevent problems. All cattle must be vaccinated and kept fenced in, and brucellosis and tuberculosis monitoring must continue, much as is being done in Yellowstone (Thorne et al, 1989). All this is expensive but feasible. If industry insists on using the area despite the risks of disease, it must pay the price for doing business. The fact that brucellosis existed in WBNP did not prevent Canadian cattle from obtaining brucellosis-free status in 1985. With proper precautions, there is no reason why this status cannot be maintained, nor why tuberculosis-free status cannot be obtained.

People

Once again, although human health concerns are not the mandate of the CNF, certain observations have not escaped our attention. There is no documented case of humans contracting the diseases from the WBNP herd (Bison Disease Task Force, no date; Murphy, 1989). However, transmittal of disease from bison to people may occasionally occur but may not be reported because the native population which is most likely to be exposed is also most likely not to seek medical attention.

Nevertheless, it is ironic that the submissions to the Environmental Assessment Review Panel indicate that Agriculture Canada's veterinarians are much more worried about possible human health problems (Agriculture Canada, 1989a, b) than is Health and

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Welfare Canada (Murphy, 1989), Alberta Health (Waters, 1989; Fanning, 1989) or GNWT Health (MacKinnon, 1989). There is no doubt that eradication of the disease would be desirable from the human health standpoint. However, present risks to human health are low and can be further reduced through an education program.

Bison

The Canadian Nature Federation considers the existence of disease in the WBNP herd a problem because of the imminent danger of infection of the disease-free MBS herd.

Tuberculosis and brucellosis were not the sole factors responsible for the decline of the WBNP herd from a peak of 12,000-14,000 in the period 1930-1950 (Anonymous, 1989) to 4,000-5,000 animals currently. Anthrax, drownings and the slaughter of animals were responsible for the death of some 20,000 bison. Brucellosis and tuberculosis, however, continue to be a contributing factor. They result in low reproductive rates and poor calf survival as well as increased predation by wolves on animals most affected by disease.

Bison are probably experiencing these problems because of deteriorating environmental conditions and because, at least in Canada, they appear to have evolved without bovine tuberculosis and brucellosis and so have not developed the immune systems required to cope with the diseases. Development of such mechanisms takes time and requires some adjustment on the part of both the bison and the disease. That such coexistence is possible is witnessed by the fact that the Yellowstone bison have adjusted to brucellosis and seem not to be adversely affected by it (Schullery, 1986). The Yellowstone herd keeps increasing and animals have to be culled constantly to reduce conflicts with private landowners adjacent to the park (Schullery, 1986; Meagher, 1985, 1989).

The current situation in WBNP is a stage in a long-term process where nature has been more or less allowed to take its course. Over the last 65 years, a complex relationship has developed among the diseases, bison and wolves. Theoretically, the constant culling of the weakest bison (usually those most affected by the diseases) by wolves serves as a means of eliminating the animals most susceptible to the disease as well as those suffering from the most acute form of the disease. This natural selection process favours the survival of the most resistant animals, while at the same time, eliminating the most

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virulent forms of the disease. In the end, one of two things will happen:

a) the animals and the disease will evolve so that the disease will no longer be a serious problem for bison; or

b) evolution will proceed at too slow a rate and the disease will cause the elimination of the WBNP bison before equilibrium is reached.

The WBNP herd has been living with the diseases for over 65 years. How much of the population decline documented since the 1970s is due to normal population fluctuations is unclear, but it appears that the population may be stabilizing, or at least the decline rate may be slowing down. If this is indeed the case, the end result described in a) may occur. There is no doubt, however, that in WBNP we are witnessing natural selection still in progress and the outcome is difficult to predict. This uncertainty has serious implications for the MBS herd and any other disease-free bison herd that might be established in the area.

There is no doubt that the disease-free MBS herd will become contaminated with disease if it makes contact with the WBNP animals, a situation likely to occur eventually despite the current bison-free zone. As the MBS herd has developed in the absence of disease, it will not have any immunity, and the disease is expected to cause a decline in numbers. This reduction in bison numbers will certainly be at least a short-term setback for the wood bison recovery effort. However, if it is a temporary decline and disease-tolerance is developed, the end result will be positive for the wood bison.

The questions we must ask are the following:

1. Can we allow natural selection to run its course in WBNP?

2. Can we permit the MBS herd to become infected with brucellosis and tuberculosis when we do not know what the outcome in WBNP will be?

The fundamental question is: does it really make a difference? There is absolutely no guarantee that an attempt to implement Agriculture Canada's solution would succeed. Similar attempts to eradicate feral water buffalo and cattle have apparently been carried out successfully elsewhere (Agriculture Canada, 1989). However, the bison are a native species well adapted to the habitat in which they live, and several herds are scattered over

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much more than 45,000 square kilometres of very difficult and inaccessible terrain both inside and outside the park. Even with considerable aerial surveillance, it is quite likely that at least some animals would go undetected during the eradication phase. It would take only one disease-carrying animal surviving to the wood bison reintroduction stage to infect the new herd. Should this happen, the disease problem would be back to its current situation. What would we do then? Would we start all over again?

The Canadian Nature Federation believes that, if at all possible, the spread of disease to the MBS herd should be prevented, at least in the short term. Thus, every effort should be made to prevent contact between the MBS and WBNP herds until the outcome of the current disease-bison interaction is known.

In the meantime, a concerted effort should be made to develop vaccines effective in bison. Work is currently under way on such a vaccine for elk, and it is being tested in the United States (Thorne *et al*, 1989). A bioabsorbable vaccine is manufactured into pellets, known as biobullets, which are shot from an airgun, eliminating the need for herding and handling animals. Results so far are very encouraging (Thorne *et al*, 1989).

NATIONAL PARKS CONSIDERATIONS

In 1988, Parliament, through amendments to the *National Parks Act*, decreed that the Minister of Environment is responsible for maintaining the ecological integrity of Canada's national parks. The proposed eradication of the bison in WBNP is in clear contravention of the spirit of the *National Parks Act* because of the impact it will have on the area's natural ecosystems.

In addition, national parks policy states that natural processes should be allowed to continue within park boundaries with no (or very minimal) interference from man. It may be argued that the bison situation we now face has been created by human interference (i.e., the 1925-28 introduction of diseased plains bison into wood bison range) and the eradication option would right past wrongs. There is no doubt that a terrible mistake was made in the early 1920s. However, is meddling with as natural a situation as we can now have justified, especially when there is no guarantee that such meddling will improve anything?

The removal operation (numerous low-flying aircraft, herding operations, the constant presence of people, proposed road construction and trucking operations, and frequent shooting)

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would cause a great deal of disturbance for all wildlife in the park. Environmental damage to the park would be inevitable. Furthermore, bison are a major element in the complex WBNP ecosystem. Their absence would have repercussions for a host of other elements as diverse as predator/prey relationships (their principle food source gone, wolves would turn to other species - moose and cattle - and many would starve) and plant communities. The WBNP ecosystem would undergo drastic changes imposed by man. Even if these changes and disturbances were temporary, their imposition would be contrary to the mandate of national parks. It would set a dangerous precedent that would pave the way for numerous "pest" control programs and for the treatment of wild animals as if they were domestic stock.

The fact that the bison in the park are hybrids and that 35-50 percent of them have brucellosis, tuberculosis or both, poses no problem for the park. Problems arise because of the implications the park bison might have for outside interests, namely, agriculture and wood bison herds. But interests outside the park cannot be allowed to dictate what goes on within park boundaries. WBNP was once a vast expanse of wilderness forest, muskeg and grassland virtually untouched by human influence. It is situated in an area that was just about as unspoiled. Slowly but relentlessly, outside interests have changed and continue to change park surroundings, creating an island of wilderness. Worse still, these interests have also changed the park itself.

The Bennett dam on the Peace River drastically altered water level regimes in the park, disrupting entire ecosystems, including habitat and wildlife. The construction of pulp mills, proposed hydroelectric developments and other ventures further threaten air and water quality in the park. And now agriculture wants to move right up to its borders and insist that park bison be managed like domestic stock so that interests external to the park are met at the expense of an important ecosystem.

Erosion of the natural state is occurring in many national parks across Canada and much of it is beyond the control of the Canadian Parks Service. Parks, even large ones like WBNP, cannot exist as islands of wilderness in a sea of development and still continue to function as complete ecosystems. A consequence of outside factors is that, little by little, processes and then entire ecosystems within parks change. Flora and fauna become impoverished, and eventually the values the parks were created to protect become degraded, or disappear altogether. Thus, parks and their surroundings must be managed as ecosystems. Agencies involved in developments outside park boundaries must ensure their actions do not have repercussions within parks.

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Consequently, agriculture must respect the integrity of WBNP and the animals living there. Expansion of agriculture towards the park should be allowed only in so far as it has no detrimental effect on the park.

From the park perspective, the introduction of increasing numbers of cattle into areas adjacent to the park is undesirable. Grazing is likely to damage current ecosystems by causing changes in plant communities, destruction of certain habitats, etc. This will increase pressures on similar habitats within the park. Moreover, studies have shown that some of the land around the park is not very suitable for agriculture (Reynolds and Hawley, 1986).

If agriculture insists on moving into the area, a situation similar to that now existing in Yellowstone (Schullery, 1986; Meagher, 1985, 1989) is likely to develop. Competition and conflicts between bison and cattlemen are likely to occur and then increase steadily, resulting in calls for the reduction of bison, be they hybrids or wood bison. Thus, a cattle-free zone around the park would be of benefit to the park. It would also benefit the cattle industry as it would prevent contact, and transmittal of disease, between bison and cattle.

The agricultural sector may argue that they have as much right to existence as parks do. We do not dispute that. However, national parks account for a grand total of only 1.6 percent of the land area of Canada while agriculture has taken over many, many times that area. The integrity of what little natural area is included in parks must be preserved.

DISCUSSION OF MANAGEMENT OPTIONS AND RECOMMENDATIONS

The situation regarding the bison in WBNP is a serious one. Agriculture wishes to move into the area adjacent to the park and has made a value judgement, namely, that cattle are more valuable than bison, a species that has only recently been pulled back from the brink of extinction. This value judgement is unacceptable.

A great deal of time and effort has gone into the wood bison recovery program. Understandably, many people and organizations wish to maintain the genetic purity and disease-free status of the MBS herd and other wood bison herds introduced in the area. Consequently, they want to prevent contact between these herds and the WBNP animals. The CNF believes it is important that such

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contact be prevented. However, we consider the maintenance of the genetic integrity of wood bison, while desirable, to be secondary to the preservation of the varied gene pool now present in the WBNP herd.

The disease question is far more complicated. We believe that if bison can coexist indefinitely with brucellosis and tuberculosis, then the short-term price of declining bison numbers is worth paying. If this cannot be achieved before the disease exterminates the bison, and if vaccines effective for bison cannot be developed, then the eradication of the WBNP herd as a last-ditch effort to prevent the eventual spread of disease to all bison may be warranted. However, even with the very best intentions, there can be no guarantee that every last animal will be killed. Neither is there a guarantee that, in future, bison will never contract the disease(s) from cattle or from other infected wildlife.

The question arises: Can we afford to destroy the most diverse bison gene pool in existence when there remains a distinct possibility that in the end brucellosis and tuberculosis will not be eliminated, and the very restricted gene pool now present in wood bison herds will become contaminated anyway? Should this happen, we will have gained nothing and lost a great deal forever.

Moreover, the integrity of national parks must be preserved and, whenever possible, natural processes must be allowed to proceed unimpeded. The proposed removal operation would cause damage to the ecosystem and to numerous wildlife species in the park. Our national parks are the only places guaranteed protection and preservation. This guarantee must be honoured. If even parks are allowed to become degraded, no examples of undamaged Canadian ecosystems will remain anywhere.

For the above reasons, the CNF insists that Agriculture Canada's eradication-replacement proposal is unacceptable.

The Canadian Nature Federation recommends the following:

1. No slaughter of WBNP bison take place.
2. The current bison-free zone between the MBS and WBNP herds should be maintained until the outcome of the current struggle between the WBNP bison and diseases becomes evident. If necessary, surveillance should be increased in this zone to minimize the chances of contact between herds.

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3. The proposed introductions of healthy bison in areas where contact with diseased animals is possible should be delayed. Although this will put the wood bison recovery program temporarily on hold, this course of action is better than an irreversible decision.

4. The required research funds should be made available immediately to develop a vaccine that would be effective and easily administered to bison without the need of capturing animals. At least a portion of the money earmarked for the eradication program should be redirected for this purpose.

5. The federal government, in co-operation with regional governments, should implement a regional management program for the WBNP area based on ecosystem management principles. A first step would be to establish a cattle-free zone around the park which would include all areas where bison roam outside park boundaries. Wherever there is a possibility of cattle contacting bison, the onus must be on the industry to implement protective measures for livestock. Cattle should be kept only in fenced enclosures and should be monitored for brucellosis and tuberculosis.

6. The final decision about the future of the WBNP herd must respect the objectives of the national parks system. To achieve this end, a non-confrontational forum for discussion should be set up where all interested persons could freely express their personal convictions, irrespective of affiliation. It is only after a full airing of views that a co-operative solution can be found.

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LITERATURE CITED

Anonymous. 1989. Dealing with the Diseases of Bison in Northern Canada, Newsletter No. 1.

Agriculture Canada. 1989a. A Proposed Course of Action to Replace Disease Exposed Bison in Northern Canada with Disease-free Wood Bison.

Agriculture Canada. 1989b. Agriculture Canada's Submission to the Northern Diseased Bison Assessment Panel.

Berg, R.T. 1989. Report to the Northern Diseased Bison Environmental Review Panel on Bison Genetics.

Bison Disease Task Force. No date. Evaluation of Brucellosis and Tuberculosis in Bison in Northern Canada.

Bork, A.M., C.M. Strobeck, F.C. Yeh, R.J. Hudson and R.K. Salmon. No date. Genetic Relationship of Wood and Plains Bison Based on Restriction Fragment Length Polymorphism, University of Alberta.

Broughton, E. 1987. Diseases affecting bison. In: Bison ecology in relation to agricultural development in the Slave River Lowlands, N.W.T., Reynolds, H.W. and A.W.L. Hawley (eds.). Occasional Paper No. 63, Canadian Wildlife Service, 34-38.

Canadian Wildlife Service. 1989. Response to FEARO's request for input at the Issues Scoping Workshop.

Carbyn, L.N. and T.Trottier. 1988. Description of Wolf Attacks on Bison Calves in Wood Buffalo National Park. Arctic, 41(4):297-302.

Fanning, E.A. 1989. Letter from Alberta Health responding to the Panel's Information Requirements.

MacKinnon, J.A. 1989. Letter from GNWT Health responding to the Panel's Information Requirements.

Meagher, M. 1985. Yellowstone's Free-Ranging Bison. Naturalist, 36(3):20-27.

Meagher, M. 1989. Evolution of Boundary Control for Bison of Yellowstone National Park. Wildlife Society Bulletin, 17:15-19.

.../18

Messier, F. 1989. Effects of Bison Population Changes on Wolf-Prey Dynamics In and Around Wood Buffalo National Park.

Murphy, A.J. 1989. Letter from Health and Welfare Canada responding to the Panel's Information Requirements.

Novakowski, N.S. 1977. Status Report on Wood Bison in Canada. Prepared for COSEWIC.

Peden, D.G. and G.J. Kraay. 1979. Comparison of blood characteristics of plains bison, wood bison, and their hybrids. Can. J. Zool., 57:1778-1784.

Reynolds, H.W. and A.W.L. Hawley (eds.). 1987). Bison Ecology in relation to agricultural development in the Slave River lowlands, N.W.T. Occasional Paper No. 63, Canadian Wildlife Service, 34-38.

Schullery, P. 1986. Drawing the Lines in Yellowstone: The American Bison as Symbol and Scourge. Orion Nature Quarterly, 5(4)

Stevenson, M. 1989. Slaughter Solution. Alberta Report, 48-50.

Thorne, E.T., M. Meagher and B. Hillman. 1989. Brucellosis in Free-Ranging Bison: Three Perspectives. Presented at: Examining the Greater Yellowstone Ecosystem -- A Symposium on Land and Resource Management.

van Zyll de Jong, C.G. 1986. A Systematic Study of Recent Bison, with Particular Consideration of the Wood Bison (Bison bison athabascae Rhoads 1898). Publications in Natural Sciences, No. 6, National Museum of Natural Sciences, Ottawa.

Wallis, C. 1990. Personal communication from President, Cottonwood Consultants, Calgary, January, 1990.

Waters, J.R. 1989. Letter from Alberta Health responding to the Panel's Information Requirements.

Wershler, C. and C. Wallis. 1989. Proposed Wood Buffalo Kill -- Are We Being Buffaloed? Wilderness Alberta, 19(3):4-5.

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For: the Alberta Wilderness Association
- Technical session of Diseased Bison
Public Hearings

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Received
Jan 26 1990
Edmonton

1. INTRODUCTION

The 1,600 or more wood bison of the Mackenzie Bison Sanctuary are the descendents of a very small genetic stock of 16 animals from the remote Nyarling River area of Wood Buffalo National Park. Nyarling animals have been judged to have been morphologically representative of wood bison (Banfield and Novakowski 1960), but with an apparent slight introgression of plains bison genes (van Zyll de Jong 1986).

On the other hand, the "hybrid" herd of 4,000-plus bison in Wood Buffalo National Park and immediate area are the descendents of several thousand wood bison and plains bison. The numbers of each species at the time of introduction have been listed as 1,500 to 2,000 wood bison and 6,673 plains bison (Wood Bison Recovery Team 1987). However, Van Camp (1989) suggests that the number of wood bison present in the park at the time of introduction of plains bison may have been considerably higher, and the total number of plains bison which survived the first winter following introduction may have been considerably lower.

Van Camp (1989) also suggests that distinct north-south sub-populations of wood bison existed prior to the introduction of plains bison, and that relatively pure wood bison were able to exisit following the widespread hybridization. The Nyarling herd is not believed to be an isolated case, and the Hook Lake herd may be at least partly descended from a relict population that predates WBNP (Van Camp 1989).

Wood bison were not totally isolated geographically from plains bison, but occupied one end of the spectrum in the concept of the species. On the genetic scale, the wood bison does not rank as highly as protecting the entire spectrum. This is not possible if depopulation of the Wood Buffalo National Park herd is allowed to proceed. Not only will we lose remnant wood bison genetics, but also a large segment of genetic diversity in the remainder of the spectrum, including intermediates. From the standpoint of the preservation of genetic diversity, depopulation is unconscionable.

2. STATEMENT OF PROBLEMS AS SEEN BY THE PANEL

There are two major problems apparently needing solution:

1. the potential spread of disease to apparently disease-free cattle, domestic bison, and wood bison, and

2. the mixing of genetics of wood bison and hybrid bison.

2.1 Disease

Tuberculosis and brucellosis have been identified as problems in terms of possible transmission to cattle, domestic bison, and non-diseased wood bison. Are these diseases all that Agriculture Canada has made them out to be? Are the figures of 36 percent incidence for each disease accurate for the entire population?

In Yellowstone National Park, brucellosis is carried by a significant proportion of the herd of plains bison, but has been found to have no negative population impact on the bison and constitutes no welfare concern. In addition, there has never been a case of bison passing brucellosis on to cattle when bison have moved outside of the park (Mary Meagher, Reserch Biologist - Yellowstone National Park pers. comm. 1990). What implications does this have on the Wood Buffalo Park herd? There appears to be a very low risk for the transmission of bovine brucellosis from a wild, free-ranging bison herd to cattle. There has been circumstantial evidence of natural transmission of brucellosis from elk herds to cattle, and one confirmed case of transmission from free-ranging elk and/or bison herds to cattle. There is also a documented case of captive coyotes transmitting brucellosis to cattle (Davis et al 1988).

In addition to bison and cattle, bovine tuberculosis has been recorded in elk, moose, mule deer, white-tailed deer, voles, wolves, and red foxes (Tessaro 1989).

Although secondary carriers of bovine brucellosis and tuberculosis are not considered to play significant roles in the spread of these diseases (Tessaro 1989), the small risk that these species present in disease transmission cannot be overlooked when you are attempting to partly justify the extermination of several thousand bison on the slim chance that cattle may be infected by diseased free-ranging bison.

If you are not 100 per cent sure (not 99.9 percent sure) of the Wood Bison Recovery and Disease Eradication option succeeding, then the program should not go ahead. All it takes is one incident of transmission to screw things up. These are the things you have to be sure about:

1. that every last bison is found within Wood Buffalo National Park and the tens of thousands of square kilometers on the surrounding lands. While this may be possible, Agriculture Canada has expressed doubts about the ability to maintain a small exclusion zone between cattle and bison. So how do we expect to confidently eliminate all bison, when we don't even think we can manage a small exclusion zone?

2. that neither tuberculosis nor brucellosis will be transmitted to wood bison or cattle from wild species other than bison

3. that diseased bison or elk from game ranches, which are becoming more popular in the region, will not escape and infect disease-free wood bison. Both tuberculosis and brucellosis have been problem diseases in game ranches because the close confinement of animals in these situations is conducive to the transmission of these contagious diseases (Tessaro 1989).

We know of no person on this planet who is able to express that kind of confidence. Simply put, the risk of failure in the undertaking of the depopulation of diseased bison option outweighs any possible gain.

If there was a real concern about protecting wood bison from disease, then cost would not be a factor in deciding not to carry out a genetic salvage of wood bison from the Wood Buffalo National Park and Slave Lowland herds. One can only assume that the wildlife people involved are not concerned about disease (or genetics) or they would be making every effort to save the remnant wood buffalo stock.

We feel, for the above reasons, that disease is not a valid reason to consider implementation of the depopulation option.

3. STATEMENT OF PROBLEMS AS SEEN BY THE ALBERTA WILDERNESS ASSOCIATION

3.1 PRIMARY PROBLEMS

After perusal of the available information, these are the major issues which we feel deserve major consideration in determining whether the Wood Bison Recovery and Disease Eradication should be allowed to proceed.

3.1.1 Genetics

Some level of introgression between wood and plains bison in prehistoric times was inevitable, and based on modern discoveries of relatively "good" wood bison in the Nyarling River and Hook Lake areas, the factors which kept the two taxa apart can still function today. We are therefore gaining variety in the preservation of the Wood Buffalo Park and area herds, not diminishing it.

In reference this, and to the historic aspects in the introduction of this brief, the following points can be made:

1. It certainly does not make any sense to kill off apparently representative wood bison which remain in Wood Buffalo National Park and in the Slave River Lowlands.

2. The importance of the broad genetic diversity of the Wood Buffalo Park and associated herds outweighs the depauperate genetic diversity of the Mackenzie Bison Sanctuary wood bison. The recovery of the wood bison can still proceed, but its terms should be revised to incorporate the preservation of the Wood Buffalo National Park and Hook Lake herds. We should be exploring ways of preserving "pure" wood bison stock in areas within the overall northern range, including a key portion of the Mackenzie Bison Reserve.

3.1.2 PROTECTION OF NATIONAL PARK VALUES

What are our National Parks about? In the 1979 Parks Canada Policy, it is stated that natural resources within national parks are to be afforded the highest degree of protection and managed with minimal interference, and that caution must be exercised before any active manipulation of park resources. This does not sound like the process followed for the diseased bison issue. Instead, the importance of Wood Buffalo National Park as one of the most outstanding national parks in the world has taken a back seat in the decision-making process to outside concerns.

How can we consider approving a slaughter of a park treasure for the preservation of wood bison genetics outside of the park, with little or no commitment to preserving what exists inside the park? And, how can we approve the slaughter for the benefit of the cattle industry? Cattle are not a central issue for Wood Buffalo National Park--the park was in place long before the encroachment of cattle into the region and just because of outside pressure we should not be drastically changing national park management. If the cattle industry wishes to expand around the park then it must be prepared to bear the brunt of the cost for fencing, monitoring disease, and managing an exclusion zone.

If forest clearing and ranching were to spread around Wood Buffalo National Park, then its value as a natural ecosystem would automatically decrease because of the loss of the natural buffer zone. As strange as it may seem, the bison disease in the park presently serves as a buffer to discourage the spread of ranching closer to the park.

We have been so focused on the bison issues that we are losing our overall perspective on ecosystem management. The rather casual manner in which the elimination of the bison has been proposed, and the quick rationalization of negative effects on the predator-prey-scavenger system are indicative of this narrow management perspective.

If there is any chance of maintaining a natural predator-prey-disease system, then Wood Buffalo National Park would appear to be the ideal place. The existing situation gives researchers a unique opportunity to monitor and study various aspects and interrelationships of this system. Is the decline of bison a temporary phenomenon? Why do some bison not contract the diseases? Will wolves eventually play a role in controlling the diseases? These are but a few of the things which could be studied and perhaps provide valuable information for managing the park and other ecosystems in the future. However, with an archaic kill-the-whole-herd attitude, there is little chance of ever gaining insight into the dynamics of these diseases and the animals that they affect.

If the Wood Bison Recovery and Disease Eradication option is carried out, the possible repricussions of negative national and international opinion toward wildlife managers and parks' professionals should not be underestimated. In Alberta, and across Canada, there is widespread opposition to the proposal; opponents include parks' and protected areas' personnel, wildlife biologists, conservationists, hunters, as well as the general public.

The implementation of this option could set a dangerous precedent for outside influence on the managment of protected area resources. What is to stop the lobbying to exterminate an elk herd in another park if disease is perceived as a threat to cattle outside of the park. What is to stop outside pressure to control pine beetle or spruce budworm outbreaks if these are viewed as threats to the timber industry?

Failure to maintain National Park values at Wood Buffalo is a clear admission of our failure to resist the demands of very narrow outside interests which have little commitment in maintaining National Park values if they conflict with the ability to make a profit.

3.2 Secondary Problems

The following points are also considered to be important issues; however, if the major issues are addressed, then these concerns will also be taken care of. An asterisk (*) denotes those points which are discussed in more detail in the "MAJOR CONCERNS" section of this brief. "Arguments For" denote arguments in favor of the proponent; "Arguments Against" denote those which oppose the proponent.

3.2.1 Establishment of Proven Risk and Urgency

Arguments For

- other agencies may be forced to take steps independently to protect the Mackenzie Bison Sanctuary herd and other herds from contacting the hybrid diseased animals in and near WBNP
- this contact could occur at any time, and should it occur, the bison disease problem in this area could expand to such proportions that solutions may never be possible

Arguments Against

- other agencies should have forseen the contact of domestic herds or the MBS herd with the WBNP herd, and taken steps to prevent contact in order to avoid what they now perceive as a crisis. It is now their responsibility to do what they can to prevent contact, and to cooperatively work out an agreement with WBNP which does not compromise Parks Canada conservation values.
- the cattle and domestic bison ranchers should not encroach any further toward WBNP and they should take steps to contain and monitor their herds to prevent contact with free-roaming bison
- more detailed information is required on the movements of the free-ranging bison herds and the causes of these movements
- at the present time, contact of cattle and diseased bison and the transmission of disease constitutes a remote possibility
- if contact of the WBNP herd with the MBS herd did occur in the near future, the entire MBS herd need not immediately be threatened; the spread of disease to the MBS herd could be prevented by a combination of buffer zone, fencing, and a knowledge of habitat and bison movements; perhaps a key portion of the MBS could be fenced

3.2.2 Protection of the Genetic Diversity of Free-ranging Wood Bison

Arguments For

- hybrid bison may interbreed with wood bison of the MBS or other free-roaming wood bison herds that may be established in the area, causing genetic contamination of the endangered (CITES), or threatened (COSEWIC), wood bison
- associated with the above, would be the interference with the reintroduction of wood bison and the eventual delisting of this species

Arguments Against

- if the value of the entire spectrum of genetic diversity in the WBNP area is recognized, then some hybridization should be allowed to occur. Some areas of "pure" wood bison can be maintained.
- the recovery of the wood bison needs to be re-evaluated in light of the recognition of the park bison as a valuable resource

3.2.3 Assessment of Ecological Impacts

Arguments For

- the re-establishment of a healthy bison population in WBNP will favour a rapid recolonization of primary bison ranges by wolves (Messier 1989)
- furbearer species should not be affected (Messier 1989)

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Arguments Against

The analysis of the predator-prey dynamics appears to be a good general assessment; however, there are some site-specific aspects relating to Wood Buffalo National Park which are commented on below.

- it is anticipated that there will be a short to mid-term problem for wolves; in addition to the decline in wolf numbers associated with the scarcity of bison during the anticipated 10 to 15 years before the bison population can be built up, there could be an significant period of time before wolves repopulate the area and begin feeding largely on bison (Lu Carbyn, Canadian Wildlife Service, pers. comm. 1990)
- the red fox is a common furbearer in the park which feeds extensively on carrion from bison carcasses; its numbers are also expected to decline significantly (Lu Carbyn pers. comm. 1990)
- there will undoubtedly be other direct and indirect effects on the ecosystem, relating to the major population declines of the previously mentioned species; these are largely unpredictable

3.2.4 Assessment of Other Environmental Impacts

Arguments For

- developments are to be placed, where possible, in areas of the park which have already been disturbed

Arguments Against

- the full range of disturbances to park resources during the course of the 10+ years have not been adequately addressed and evaluated.
- besides impacting the physical environment, the proposed operation will affect the experience of the tourist in major portions of the park

3.2.5 Assessment of Socio-economic and Cultural Impacts

Arguments For

- tourism will ultimately benefit from the replacement of diseased bison with wood bison in the park area
- the status of WBNP as a World Heritage Site will be strengthened
- native people will receive bison meat from other sources during the period of time when they cannot hunt bison in the area
- native people will benefit from abattoir facilities which will remain following the project

Arguments Against

- alot of groups are very concerned, if not outright opposed, to the eradication of the WBNP herd
- the possibility of negative international opinion is very real
- there will undoubtedly be negative impacts on the existing and potential tourist industry
- many native groups in the region are opposed to the proposed kill. The loss of hunting opportunity, for whatever length of time, will impact on the traditional way of life. The following quotes from Ferguson (1989) express some of the native concerns:

> "Harvesters feel quite confident that the harvesting of diseased bison over the past decades has not proven injurious to their health."
> "Overwhelmingly, Native groups and individuals challenge the Task Force's statement that bison of WBNP area currently suffer such a high rate of disease"
> "...incongruity between the hunters' own observations in butchering bison and the conclusions offered by the Task Force leads the people to question the biological data."
> "People speculate that such figures involve are derived from samples which are too small or which do not involve a representative selection of age and sex groups."
> "Whether this data reflects current disease rates is also questioned."

4. CLOSING ARGUMENT

If the Wood Bison Recovery and Disease Eradication option proceeds there will be: vast sums of money spent; certain and unknown impacts on the ecosystem; certain and unknown impacts of environmental damage; and negative impacts on the native population and traditional way of life. All of this, with the possibility that there still could be transmission of disease into a newly introduced wood bison herd which would have less genetic variety than the present herd.

5. RECOMMENDATIONS

While it is easy to criticize, we do not envy the position in which various professionals have been placed. We feel that these hearings are beneficial in that we can come together and crystallize our ideas regarding Wood Buffalo National Park.

The following suggestions are consistent with National Park values. Our proposal is to:

1. have anyone who is interested in raising cattle and domestic bison fence in their stock at their own expense;

2. if it is deemed necessary, a disease-free, "pure" wood bison herd should be maintained at the Mackenzie Bison Sanctuary; this could incorporate fencing, management of an exclusion zone, habitat enhancement, and monitoring bison movements;

3. study diseased animals within the park for research purposes, in combination with a study on the wolf-bison/predator-prey relationship and the movements of bison herds;

4. carry out an assessment of natural and man-made influences on the ecosystem and what effect they are having on the bison;

5. set up a management committee, similar to that of Waterton National Park, to consider problems in the surrounding area, and modification of management of the surrounding lands to minimize impacts on the ecosystem; and

6. while not of high priority, possibly developing more effective types and methods of vaccines, such as an oral vaccine for brucellosis

6. LITERATURE CITED

Banfield, A.W.F. and N.S. Novakowski. 1960. The survival of the wood bison (*Bison bison athabascae*) in the Northwest Territories. National Museum of Canada Natural History Paper No. 8., Ottawa.

Davis, D.S., F.C. Hech, J.D. Williams, T.R. Simpson and L.G. Adams. 1988. Interspecific transmission of *Brucella abortus* from experimentally infected coyotes (*Canis latrans*) to parturient cattle. Journal of Wildlife Disease 24: 533-537.

Ferguson, T.A. 1989. Native perspectives on the northern diseased bison issue: an outline. A report presented to the Northern Diseased Bison Environmental Assessment Panel, October 15, 1989.

Messier, F. 1989. Effects of bison population changes on wolf-prey dynamics in and around Wood Buffalo National Park. Prepared on behalf of the Federal Environmental Assessment Review Office, Environment Canada and the Northern Diseased Bison Environmental Assessment Panel, October 5, 1989.

Tessaro, S.V. 1989. The existing and potential significance of bovine brucellosis and tuberculosis in Canadian wildlife. Agriculture Canada. Saskatoon.

Van Camp, J. 1989. A surviving herd of endangered wood bison at Hook Lake, N.W.T.? Arctic 42(4): 314-322.

Wood Bison Recovery Team. 1987. Status report on wood bison (Bison bison athabascae) in Canada, 1987. Prepared for the Committee on the Status of Endangered Wildlife in Canada.

Received
Edmonton
Jan 25 1990

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IMPLICATIONS OF DISEASED BISON POPULATIONS IN NORTHERN CANADA FOR THE RECOVERY OF WOOD BISON

A SUBMISSION TO
THE NORTHERN DISEASED BISON ASSESSMENT PANEL

PREPARED BY:
THE WOOD BISON RECOVERY TEAM

January 1990

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1.0 INTRODUCTION

The purpose of this submission to the Northern Diseased Bison Environmental Assessment Panel is to document the significance of the diseased bison problem to the recovery potential of wood bison and to the restoration of natural ecosystem processes in the boreal forest biome in which the historic range of the wood bison lies.

1.1 Conservation Philosophy

During the course of evolution, many species of animals and plants have come and gone. In fact, the history of this planet has been marked by a series of mass extinctions, the last of which was completed about 66 million years ago when almost all dinosaurs died out, along with 60% to 80% of other animal species. Mammals, which had coexisted for millions of years along side the dinosaurs, survived that particular mass extinction and their evolution began to radiate in a wide variety of ways.

At the present time, the world is in the midst of another mass extinction which began about 11,000 years ago, at the end of the last ice age. It was the first mass extinction that may have been helped by the hand of humanity. One theory suggests that within a few thousand years of the arrival of people in North America, the human hunter, with his modest technology in the form of traps, snares, and sharp pointed weapons, had brought about the extinction of 70% of the large mammal fauna such as the mastodon, mammoth, and sabre-toothed tiger, all of which had survived the latest ice age.

After the last ice age was over, deer and bison spread from Asia across a land bridge into northwestern North America, then they radiated out over the continent. Meanwhile, humans were was refining their weaponry, which, with the development of firearms, led to an ever-increasing rate of extinction. This was exacerbated by human colonization of wildlands and conversion of native habitat to agriculture, the human endeavour which contributed most significantly to the near extinction of the North American bison. Humans played a hand in another way, by introducing alien organisms that became the predators, competitors or pathogens of previously unexposed indigenous species. Since the year 1600 AD, more than 50 mammal species and more than 100 bird species have disappeared from the world forever, mostly at the hand of people.

All species and subspecies are potentially valuable, because they represent a bank of genetic resources which may be used for the benefit of humans, in addition to the role that they play in maintaining natural ecological processes. It is therefore very important to recognize that the world's genetic heritage must be maintained, so that future options to draw on this resource can be kept open and ecosystems may remain intact.

Humans, as the currently dominant species on this planet, have an obligation to protect and conserve other life forms. Functioning ecosystems and the species contained therein must be seen as valuable in their own right and it is our collective responsibility to ensure that they are perpetuated.

An appreciation for these concepts led to the development of the World Conservation Strategy which is now endorsed by many nations around the world.

1.2 World Conservation Strategy

The World Conservation Strategy (WCS) was prepared by the International Union For The Conservation Of Nature (IUCN) in 1980 and was the first real attempt to integrate economic development with environmental conservation. The WCS came from a realization that we human beings have an almost unlimited capacity for building and developing, but at the same time we have an almost equal capacity for destruction and annihilation. Resource exploitation cannot be allowed to continue unchecked if it is accompanied by ever increasing environmental degradation and destruction. If it does, then it will only be a matter of time before the capacity of the world environment to supply resources for our use is exceeded and we are left with an environmental and economic disaster. Living resources essential for human survival are fast disappearing, while at the same time, the human demand is fast increasing.

The WCS attempts to address the problem of over-exploitation of natural resources by introducing the concept of sustainable development. Sustainable development simply means that we do not remove more from the environment than it is capable of producing on a continuing basis. Economic development and environmental conservation, two opposing forces in the past, have been brought together in the WCS. With compromises on both sides, both forces can be accommodated under the concept of sustained development.

The WCS promoted achievement of three main objectives:

1. To maintain essential ecological processes and life-support systems (such as soil regeneration and protection, recycling of nutrients, and the cleansing of rivers and water bodies) on which human survival and development depends.

2. To preserve genetic diversity so that we keep our options open for breeding new varieties of plants and animals, and developing new drugs.

3. To ensure the sustainable utilization of species and ecosystems, notably fish and wildlife, forests, and grazing lands which support millions of rural communities as well as major industries.

The WCS has been endorsed by the Government of Canada and most nations of the world actively promote its goals.

1.3 RENEW

A national strategy has recently been developed in Canada, which is called RENEW, meaning the REcovery of Nationally Endangered Wildlife. The objectives of RENEW are that:

- no endangered species of wildlife be allowed to become extirpated or extinct;
- no species be allowed to become threatened or move from threatened to endangered status;
- extirpated species be reintroduced to Canada where feasible;
- recovery plans be prepared for all threatened and endangered species by 1992; and,
- where feasible, recovery programs be undertaken on a scale necessary to remove species from threatened, endangered, or extirpated status.

These objectives have been endorsed by all provinces, territories, the federal government and major non-government organizations, with an agreement to work cooperatively.

A RENEW committee, consisting of provincial and territorial Wildlife Directors and representatives from the World Wildlife Fund, the Canadian Nature Federation, and the Canadian Wildlife Federation has been established. One of the main functions of the committee is to encourage the cooperation and support of non-government organizations, technical and academic experts, private companies and others to work for the recovery of endangered species. The committee appoints Recovery Teams consisting of representatives from each jurisdiction in which the species occurs, and appropriate scientific experts invited from universities and conservation groups. Recovery Teams are responsible for developing plans that specify distribution and target population sizes required to remove the species from the endangered species list. Those agencies which have primary management responsibility for the species are responsible for implementing the plan, with assistance from cooperators.

1.4 IUCN Position Paper On Translocations

In 1987, the IUCN published "The IUCN Position Statement On Translocation of Living Organisms" which described the advantageous uses of translocations and the work and precautions needed to avoid the disastrous consequences of poorly planned translocations. The paper sets out procedures to be followed for Introductions, Re-Introductions, and Re-stocking of species into their former historic range. These terms are defined as follows:

Introduction of an organism is the intentional or accidental dispersal by human agency of a living organism outside its historically known native range.

Re-introduction of an organism is the intentional movement of an organism onto a part of its native range from which it has disappeared or become extirpated in historic times as a result of human activities or natural catastrophe.

Re-stocking is the movement of numbers of plants or animals of a species with the intention of building up the number of individuals of that species in an original habitat.

The position statement stresses caution in planning introductions. The damage done by introduction and establishment of alien species in areas where they did not formerly occur, as an accidental or intended result of human activities, is noted. Such introductions break down the genetic isolation of communities of co-evolving species of plants and animals that comprise the biological wealth of our planet.

The document states that "No alien species should be deliberately introduced into any natural habitat, island, lake, seas, ocean or centre of endemism whether within or beyond the limits of national jurisdiction." The document also states that during planning for introductions, consideration must be given to a number of concerns, of which three examples follow:

- What is the probability that the exotic species will spread and invade habitats besides those in which the introduction was planned?
- What is the capacity of the species to eradicate or reduce native species by interbreeding with them?
- Is the species the host to diseases or parasites communicable to other flora and fauna, man, his crops or domestic animals, in the area of introduction.

IUCN further states that in general, introductions of no apparent benefit to people, but which are having a negative effect on the native flora and fauna into which they have been introduced, should be removed or eradicated. This is particularly true if the introduced species is jeopardizing a threatened endemic species. Where an introduced population is believed to have a value in its own right, but is associated with changes in the balance of native vegetation or fauna, the conservation of the native flora and fauna should always take precedence.

With respect to re-introductions, the position paper states that re-introductions are a particularly useful tool for restoring a species to an original habitat where it has become extirpated due to human persecution, over-collecting, over-harvesting or habitat deterioration, but where these factors can now be controlled. Re-introductions should only take place where the original causes of extirpation have been removed and only if the habitat requirements of the species are satisfied.

1.5 Definition Of A Subspecies

Much debate has occurred over the years among taxonomists in trying to define terms such as species and subspecies. Although the concept is simple, adequate working definitions of these terms have yet to be agreed upon. The primary reason for this is that classification systems are artificial, in that they have been invented by people for a particular purpose. The Linnaean system of classification has been in use for several hundred years and it provides both a name for every living organism, and gives some idea of an organisms relatedness to other organisms. For example, closely related species are placed in the same genus, and closely related genera are placed in the same family. However, speciation is a slow process, with all new species being derived from existing species. For example, populations within a species become geographically isolated, or spill into new environments, where individuals with particular attributes that allow them to better exploit their habitat become favoured through natural selection. This leads to a slow drift in characteristics from that of the parent species. Through evolutionary time, sufficient differences accumulate so that the population can now be considered to be a subspecies, which if it remains isolated for long enough from the parent species, may develop sufficient new characteristics to become a species.

Species are reproductively isolated units, wherein the individuals can reproduce amongst themselves. In general, a species possesses sufficiently distinct characteristics that individuals can readily be distinguished from those of other species. On the other hand, subspecies of a particular species, being more closely related, have more characteristics in common.

While populations within subspecies may be distinguished from those of another subspecies, individuals, taken in isolation, may be more difficult to classify since they may have any degree of distinctness. Subspecies are dynamic, and not static entities, being in an evolutionary phase of accumulating more and more genetic differences.

Two subspecies may contain essentially the same genes, but differ markedly in the frequency with which certain alleles occur in the population. Attempts have been made to quantify these genetic differences between populations to determine if subspecific status is warranted. A "90% rule" has been suggested wherein 90% of the individuals in a population of one subspecies differ from 90% of the individuals in a population of another subspecies in the character used to discriminate (Chambers and Bayless 1983). The presence of subspecies is a good indicator of genetic diversity within a species and conservation of subspecies is actively pursued by wildlife managers.

Different subspecies of a species usually occur in different territories and habitats, where they are therefore reproductively isolated. This isolation, over time, allows genetic adaptations to accumulate. The longer the separation, the greater will be the opportunity for these genetic changes to appear. As a rule, genetic differences manifest themselves in differences in colour, size, and properties of various body parts. These external manifestations of the genotypic differences permit recognition of every individual as belonging to a certain species and sometimes as belonging to a certain subspecies. It is therefore justifiable to characterize species and subspecies by visible external characteristics.

1.6 Subspecific Status Of Wood Bison

With respect to North American bison, it is generally agreed that prior to the mass slaughters of the 19th century, wood and plains bison occupied different habitats, and, although their ranges may have overlapped somewhat, it was unlikely that both subspecies were on common range during the breeding season because of migratory habits (van Zyll de Jong 1986). Thus reproductive isolation was maintained by differing habitat preferences and behaviourial responses. In addition, populations of each subspecies could readily be distinguished on the basis of visible characteristics, so classification as a subspecies was in accordance with accepted criteria. Allen (1876), Seton (1886) and Ogilvie (1893) were among the first to describe wood bison as distinct from plains bison. Rhoads (1897) provided the first scientific description of the wood bison as a distinct subspecies. Since then many other scientists (Raup 1933, Soper 1941, Skinner and Kaisen 1947, Banfield and Novakowski 1960, Flerov 1965, Karsten 1975, Geist and Karsten 1977) have acknowledged the subspecific status of wood bison in agreement with Rhoads.

With the introduction of plains bison to Wood Buffalo National Park (WBNP), the opportunity for cross breeding between subspecies occurred. However, a small population of bison that was thought to have had little contact with the plains bison was discovered in 1957 at the north end of the park. In 1959, five specimens were collected from the herd of about 200 animals. Three adults were photographed and the skulls and skins were sent to the National Museum of Natural Sciences in Ottawa. Pelage characteristics, size, and cranial measurements compared favourably with specimens of authentic wood bison (Banfield and Novakowski 1960). The Nyarling River herd was, accordingly, classified as morphologically representative of wood bison. Two capture operations salvaged 42 of these animals; 18 were transferred to the Mackenzie Bison Sanctuary in 1963 and 24 were successfully shipped to Elk Island National Park (EINP) during 1965-68. Taxonomic studies by the National Museum of Canada have fully justified the subspecific status of the original wood and plains bison (Banfield and Novakowski 1960, van Zyll de Jong 1986). The most recent study concluded that the wood bison used as founding stock for the Mackenzie and EINP populations, in spite of an apparent slight introgression of plains bison genes, warranted inclusion in the wood bison subspecies (van Zyll de Jong 1986).

In 1977, the Convention on International Trade in Endangered Species (CITES) placed the wood bison on Appendix I, thereby prohibiting international commercial trade. Wood bison were recognized by the Committee On the Status Of Endangered Species Of Wildlife In Canada (COSEWIC) as a endangered subspecies of Canadian wildlife in 1978. This status was changed to threatened in June 1988 by COSEWIC based on data presented in a revised status report prepared by the Wood Bison Recovery Team. In addition, RENEW has placed wood bison on its priority list.

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2.0 GOALS AND OBJECTIVES OF THE WOOD BISON RECOVERY PROGRAM

Under the terms of reference of RENEW, the Wood Bison Recovery Team is currently preparing a Recovery Plan for the subspecies in Canada. The plan is consistent with the principles outlined in the WCS and with guidelines established by the IUCN for re-introducing indigenous species to historic habitat. One main goal and six objectives serve as the basis for securing the continued recovery and conservation of the wood bison.

The main goal of the Recovery Plan is:

To ensure the survival of the wood bison as a wild subspecies, ie., a subspecies in its natural state acted on by the full spectrum of natural environmental factors that determine its character.

Specific objectives that satisfy this goal are the following:

1. To establish at least four wild herds of wood bison, each exceeding 200 animals.

   COSEWIC accepted a recommendation from the Wood Bison Recovery Team (1987) that the minimum size and number of wood bison herds be 200 and four, respectively, as the criterion for removing the wood bison from the list of wildlife species endangered in Canada. There are at present only two such herds.

2. To achieve the greatest possible recovery of the wood bison in its historic and prehistoric range under natural or near natural conditions, including free-ranging and captive semi-wild populations.

   The objective of establishing four wild herds ≤ 200 in size is seen as a minimum criterion to ensure survival, but additional recovery is desirable. Greater recovery of the wood bison will further reduce the risk of extinction and will provide greater benefits to Canadians.

3. To maintain the genetic integrity of wood bison populations.

   Threats to the genetic integrity of existing and possible future wood bison stocks arise from the existence of free ranging hybrid bison (plains X wood bison), feral plains bison escaped from private commercial herds and from hybridization programs within commercial herds.

4. To manage or prevent the occurrence of serious diseases, parasitic, viral or bacterial in origin, in captive and free-ranging herds of wood bison.

   The risk of infection of wood bison with pathogens that affect productivity, morbidity and mortality should be managed to prevent a reduction in the present and future value of the subspecies to Canadians and diminishment of the potential for further recovery.

5. To manage wood bison herds for sustained viability.

   The growth or persistence of reintroduced herds depends on active management based on sound information on resource requirements of the bison and natural and artificial factors that may limit population growth. Sustainable use of wood bison is consistent with wood bison recovery and conservation.

6. To promote public support of the recovery program.

   Government and non-government agencies participating in the RENEW program should be actively involved in encouraging public awareness of the successes and potential of the program and of the factors that impede or obstruct recovery.

3.0 HISTORIC STATUS AND DISTRIBUTION OF WOOD BISON

3.1 Early History

Historically, the range of the wood bison was centred on the north central section of the Interior Plains Physiographic Region of Canada (Rowe 1972) including northern Alberta, southwestern Northwest Territories (NWT), northeastern British Columbia, and a small portion of northwestern Saskatchewan (Fig.1). Samuel Hearne, one of the earliest Hudson Bay Company explorers, was the first European to provide a record of the wood bison subsequent to his journey through the Lower Slave River region of the NWT in 1772 (Hearne 1795).

Wood bison were never as numerous as plains bison and were distributed unevenly throughout a large area of the boreal forest. Several descriptions of their abundance varying from "very plentiful", "reasonably numerous", to "no doubt as to the abundance" were recorded in the accounts of early explorers (Soper 1941). Soper (1941) estimated the total population of wood bison in 1800 at about 168,000 animals, based on a rough estimate of carrying capacity within the known area of range occupied.

3.2 Near Extinction

The wood bison, like the plains bison, was nearly eliminated during the late 1800s. Its decline coincided with the rapid demise of the plains bison between 1840 and 1900 (Raup 1933). The most rapid depletion took place after 1860 (Soper 1941). By 1875, the wood bison had disappeared throughout much of its original range. The total population in 1888 was estimated at between 500 and 600 animals (Schultz 1888). In 1891, only 300 wood bison remained in the wilderness area between Great Slave Lake and the Peace-Athabasca Delta (Ogilvie 1893). The population reached an estimated low of approximately 250 during 1896-1900 (Soper 1941). After 1900, bison were occasionally observed throughout their historical range, but numbers were insignificant in areas other than the Slave River lowlands and the Peace-Athabasca regions. In northeastern British Columbia, the last reported bison was shot in 1906 (MacGregor 1952). The specific cause of the decline of the wood bison throughout its range is unknown, but the introduction of firearms and several severe winters may have been contributing factors (Raup 1933).

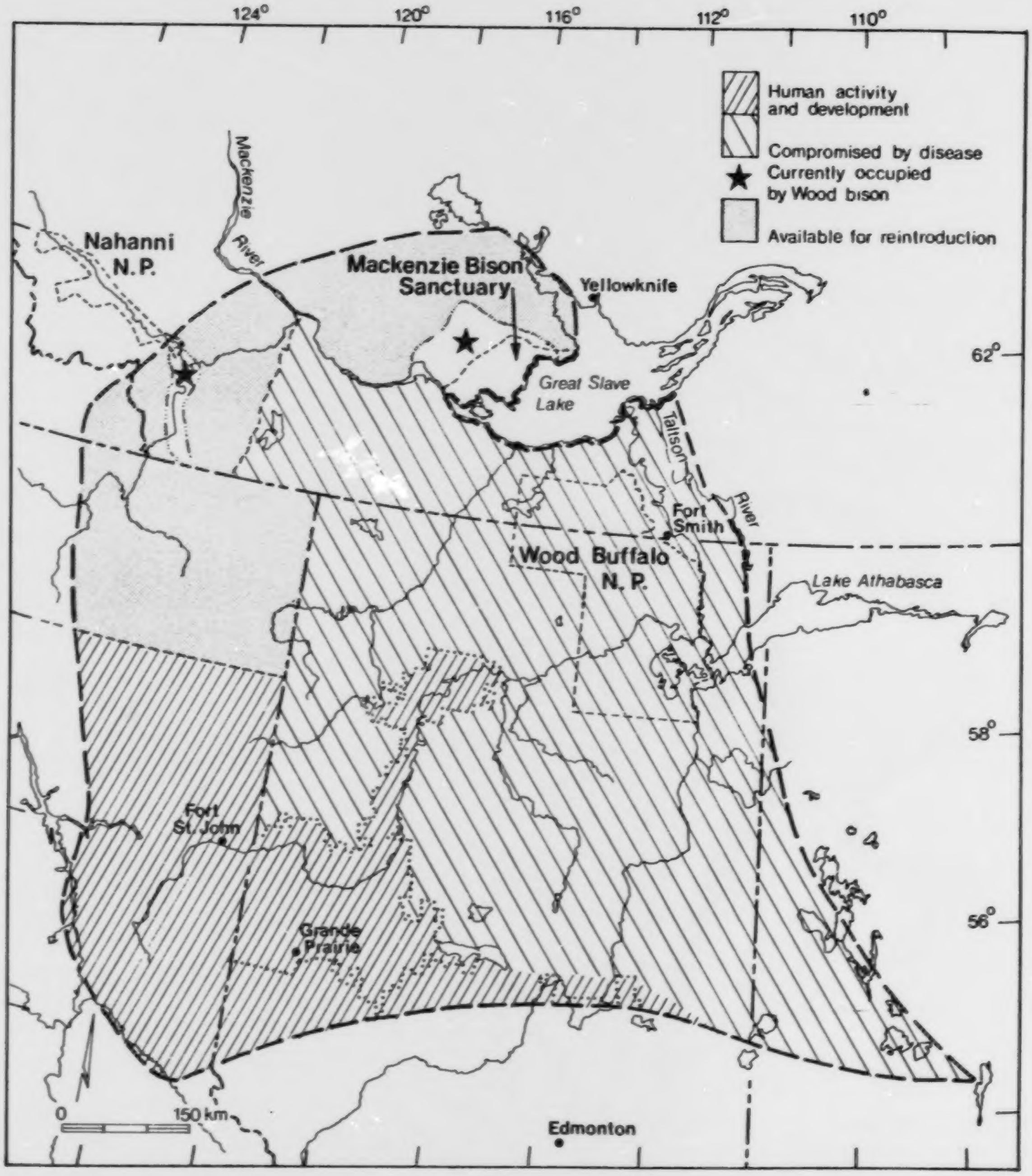
124°
120°
116°
112°
110°
62°
58°
56°
Human activity and development
Compromised by disease
Currently occupied by Wood bison
Available for reintroduction
Mackenzie River
Nahanni N.P.
Mackenzie Bison Sanctuary
Yellowknife
Great Slave Lake
Taltson River
Fort Smith
Wood Buffalo N.P.
Lake Athabasca
Fort St. John
Grande Prairie
Edmonton
0
150 km

Figure 1. The availability of range for wood bison recovery within the historic range of the subspecies.

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3.3 Early Conservation

Early conservation efforts began in 1877 with the passing of the Buffalo Protection Act (Hewitt 1921); however, this measure was largely ineffective because of lack of enforcement. Legislation was reinforced in 1893 when the Dominion Government passed a law to protect the surviving wood bison (Soper 1941). Enforcement of this legislation was minimal until 1897 when the enforcement mandate was assigned to the Northwest Mounted Police. In 1907, the first police outpost was established at Fort Fitzgerald on the Slave River and the first formal patrol of the region occurred. In 1911, six Buffalo Rangers were appointed to patrol the northern range of the wood bison. The wood bison population increased slowly to approximately 500 by 1914 (Banfield and Novakowski 1960).

In 1922, Wood Buffalo Park was established by an Order-In-Council under the Forest Reserves and Parks Act in an attempt to save the wood bison from extinction and to protect its habitat (Soper 1941; Lothian 1979). The number of wood bison on the entire range at that time was estimated at between 1500 and 2000 (Seibert 1925; Soper 1941). Wood Buffalo Park became Wood Buffalo National Park in 1943 when it was included in the schedule to the National Parks Act (Mitchell 1976).

3.4 The Introduction Of Plains Bison

In 1905, the largest privately owned herd of pure plains bison in North America was threatened by the loss of grazing rights. Following negotiations between the Canadian government and the owner, 410 plains bison were purchased from the Pablo-Allard herd and shipped from Montana to Elk Island National Park in 1907 (Lothian 1981). On completion of the newly enclosed Buffalo Park at Wainwright, Alberta in 1909, 325 plains bison from EINP, 218 plains bison from the original herd in Montana, and 77 plains bison from the exhibition herd in Banff were brought to Wainwright to form the core herd (Lothian 1981). Several more shipments of animals over the next five years brought the total number of plains bison introduced at Wainwright to 748. A census of the Buffalo Park herd conducted in 1913 indicated 1188 head of plains bison, but by 1923 the herd had increased to 6780. The range was being depleted and overcrowding was a problem.

Buffalo Park administrators announced a proposal for a phased slaughter to control the herd, but the plan received such public criticism that it was temporarily abandoned. A publicly more acceptable solution to the excess plains bison problem at Wainwright was to ship animals north to the recently created Wood Buffalo Park (Graham 1924). From 1925 to 1928, 6673 young plains bison were transported by rail from Wainwright to Waterways (now

Fort McMurray), Alberta, the railway terminus, and then by barge down the Athabasca and Slave Rivers to Labutte Landing in Wood Buffalo Park near Hay Camp (Lothian 1981). The bison were then released at several sites along the west bank of the Slave River, south and north of Hay Camp, into range that was occupied by wood bison (Soper 1941). The transfer of plains bison into historic wood bison range and into contact with the wood bison subspecies was seriously challenged by the American Society of Mammalogists (Howell 1925) and by individual biologists (Harper 1925; Saunders 1925). They believed that interbreeding would result in the loss of both subspecies of bison and that the wood bison population would become infected with disease.

The two subspecies of bison interbred as had been predicted. Subsequently, the number of hybrid bison in WBNP increased to an estimated 12,000 by 1934 (Soper 1941). Raup (1933) reported that the wood buffalo, as a race, was rapidly disappearing but speculated that an intact northern herd still survived. However, by 1940 it was believed that pure wood bison had become extinct as a result of hybridization.

Wood bison were considered to be disease-free at the time of the introduction of the plains bison; however, specific evidence of that status is not available. Bovine tuberculosis (Mycobacterium bovis) was identified in the Wainwright herd in 1919 and had probably been introduced as a result of cross-fostering of plains bison calves with domestic cows (Hadwen 1942). In 1923, 75% of the animals slaughtered at Wainwright had tuberculosis-like lesions. This discovery led to a decision to transfer only young bison to WBNP in the mistaken belief that tuberculosis was a disease of old animals only. The Wainrwright herd was eventually destroyed in 1940. The first occurrence of tuberculosis in bison in WBNP was reported in 1937-38 (Mitchell 1976). Choquette et al. (1961) reported tuberculosis-like lesions observed in WBNP bison in 1947-48. Brucellosis (Brucella abortus) was detected in bison in Wood Buffalo National Park in 1956 when three of 11 sera were found positive on agglutination tests (Corner and Connell, 1958).

The bison in and around WBNP and Slave River Lowlands are recognized as the largest reservoir, and the only existing wildlife reservoir, of bovine brucellosis and tuberculosis in Canada (Tessaro 1986).

3.5 Origin of the Wood Bison Recovery Program

During the 1950s, some zoologists expressed belief that small groups of wood bison still existed in remote areas of WBNP (Fuller 1962; Novakowski and Stevens 1965). In 1957, N. Novakowski observed bison in the Nyarling River and Buffalo Lake area of northwestern WBNP during an aerial survey. With the classification of the Nyarling herd as morphologically representative of wood bison (Banfield and Novakowski 1960), a recovery program for the subspecies was initiated in 1963, as cooperative venture between the Canadian Parks system and the Canadian Wildlife Service. Since 1975 several other government and non-government agencies have become participants in the recovery program that is now 27 years old.

4.0 CURRENT STATUS OF WOOD BISON IN CANADA

4.1 Herds In Historic And Prehistoric Range

Mackenzie Population

In 1963, 77 wood bison were captured in northern Wood Buffalo National Park to establish a captive breeding herd. After testing for diseases, 19 bison were transported to a holding corral near Fort Smith, Northwest Territories. In June 1963, an outbreak of anthrax occurred for the second time among free-ranging bison north of the holding site. A decision was made to transfer the captive herd to an uninhabited area several hundred kilometres away on the west side of Great Slave Lake. The 18 animals moved to the Mackenzie Bison Sanctuary in 1963 have since given rise to the world's largest and most successful wood bison herd.

During the period 1963 to 1987, the Mackenzie population increased at an average exponential rate of r = 0.215; 1718 were counted in April 1987 (Gates and Larter 1989). The area occupied by the herd increased at a rate echoing the herd's growth. It now ranges over an area exceeding 8000 km^2. In recent years the growth of the herd has slowed, because natural regulating factors such as predation have started to have an effect. In April 1989 the population was estimated to number 2040, representing 93% of all wood bison in historic and prehistoric range or 96% of free-ranging wood bison (Table 1). However in May 1989, some bison ranging in the southeast area of the Mackenzie Bison Sanctuary encountered unusual ice conditions on a flooded wet meadow; 177 were trapped and died in the deteriorating spring ice. The loss is a temporary setback for the herd which is free of bovine tuberculosis and brucellosis and is comprised of animals in excellent condition.

Nahanni Population

In 1980, 28 wood bison were transported from Elk Island National Park to a site near Nahanni Butte located at the edge of the Mackenzie Mountains in southwestern Northwest Territories. Upon release to the wild the herd fragmented, some travelling over 250 km into British Columbia. Accidental deaths contributed further losses and the herd dwindled to 14 by the following year. Since 1981, the small population has increased steadily at about 10% annually, to approximately 40 bison in 1989. In March 1989 the herd was augmented with another release of 12 wood bison transported north from a zoo in southern Saskatchewan. Four calves were seen accompanying the newly released group in July 1989, a sign that the transfer was successful.

Table 1. Status of wood bison in April 1989.

	Free-ranging	Confined
Herds in historic and prehistoric range		
Mackenzie, NWT	2040	0
Nahanni, NWT	52	0
Nisling River, Yukon	42	19
Hay-Zama, Alta	0	29
Subtotal	2134	48
Herds outside the historic range		
Elk Island National Park, Alta.	0	300
Waterhen Wood Bison Ranches Ltd., Man.	0	200
Zoos and wild animal parks		
Calgary Zoo, Alta.	0	3
Valley Zoo, Alta.	0	2
Alberta Wildlife Park	0	45
Moose Jaw Wild Animal Park, Sask.	0	3
Metro Zoo, Toronto, Ont.	0	36
Banff National Park, Alta.	0	9
Subtotal	0	598
Total	2134	646
Grand total	2780	

Nisling River Population

In March 1986, 34 wood bison were transported from Elk Island National Park and released into a 5 km^2 fenced area in the flood plain of the Nisling River located 80 km west of Carmacks, Yukon Territory. The herd prospered under intensive management and 21 wood bison were released from the enclosure in March 1988. Additional animals were released in 1989, bringing the total free-ranging herd to 42 head. In March 1989, ten calves from a Saskatchewan zoo were transported to the fenced area. In total, 19 wood bison remain in the enclosure as insurance against unforseen losses within the wild herd. A recently approved management plan outlines a course of action for annual releases and importing supplementary stock in an effort to achieve a wild herd of 200 by 1994.

Hay-Zama Population

A wood bison reestablishment project was initiated in northwestern Alberta in 1981 in cooperation with the Dene Tha Indian Band. A site was selected in the vicinity of Hay-Zama Lakes and a 3 km^2 holding corral was constructed. The first shipment of 29 wood bison arrived in February 1984. Flooding conditions and severe winter weather have resulted in the need for supplementary feeding in the compound. Problems of poor reproduction and calf survival have limited growth of the herd. In April 1989 there were 29 wood bison in the enclosure. The release project has been indefinitely postponed because of the risk of infection with bovine tuberculosis and brucellosis from free-ranging bison found in the region. Negotiations are underway to develop a cooperative agreement for removal of the captive herd and return of the wood bison, once an acceptable solution to the disease problem is found.

4.2 Herds Outside The Historic Range Of Wood Bison

Elk Island National Park Population

A second roundup of wood bison was held in northern WBNP in 1965. Of the 47 animals captured, 21 were successfully transferred to EINP in central Alberta. Three additional calves were transported from WBNP to EINP, one in 1966 and two in 1968. The EINP wood bison herd has played a critical role in the recovery of wood bison in Canada. It has provided stock for the re-introduction of two wild populations, for a fenced herd intended for release to the wild, a commercial ranch, six captive breeding herds in Canada and two zoo herds abroad. The wood bison herd at Elk Island was declared free of bovine brucellosis and tuberculosis in 1971, after an intensive disease eradication program had been carried out for six years. In April 1989 the population was approximately 300. It is a semi-wild fenced population that is provided with supplemental feed only during annual round-up activities and interacts with a full complement of natural environmental factors, with the exception of predators.

Waterhen Wood Bison Ranch Herd

In February 1984, 34 wood bison were transferred to a 23 km^2 enclosure in the northern Interlake region of Manitoba. By April 1989 the enclosure had been increased to 39km^2 and the herd had increased to approximately 200 bison, as a result of subsequent shipments and births within the enclosure. All wood bison transferred to Manitoba were from captive herds in Canada and from EINP. The success of the Waterhen project can be attributed to the keen interest and sustained effort of the Waterhen Indian Band and the support of government and non-government agencies. The herd is managed for commercial production. In June 1989 wood bison were sold to two private bison breeders and two bulls were slaughtered for the commercial meat market. This marks the only commercial use of wood bison in Canada.

Zoos And Wild Animal Parks

With the rapid growth of the EINP herd during the early 1970's, the need to broaden the geographic distribution of captive herds was recognized as a measure to reduce the risk of inadvertent loss of the gene pool. In 1976, the Calgary Zoo received four calves, the first transfer of wood bison from EINP to establish a captive breeding herd. Between 1976 and 1982, successful transfers of wood bison were made to seven zoos and wild animal parks, including five in Canada and two abroad. In April 1989 there were 98 wood bison held in zoos and parks, including 9 held in a display enclosure in Banff National Park.

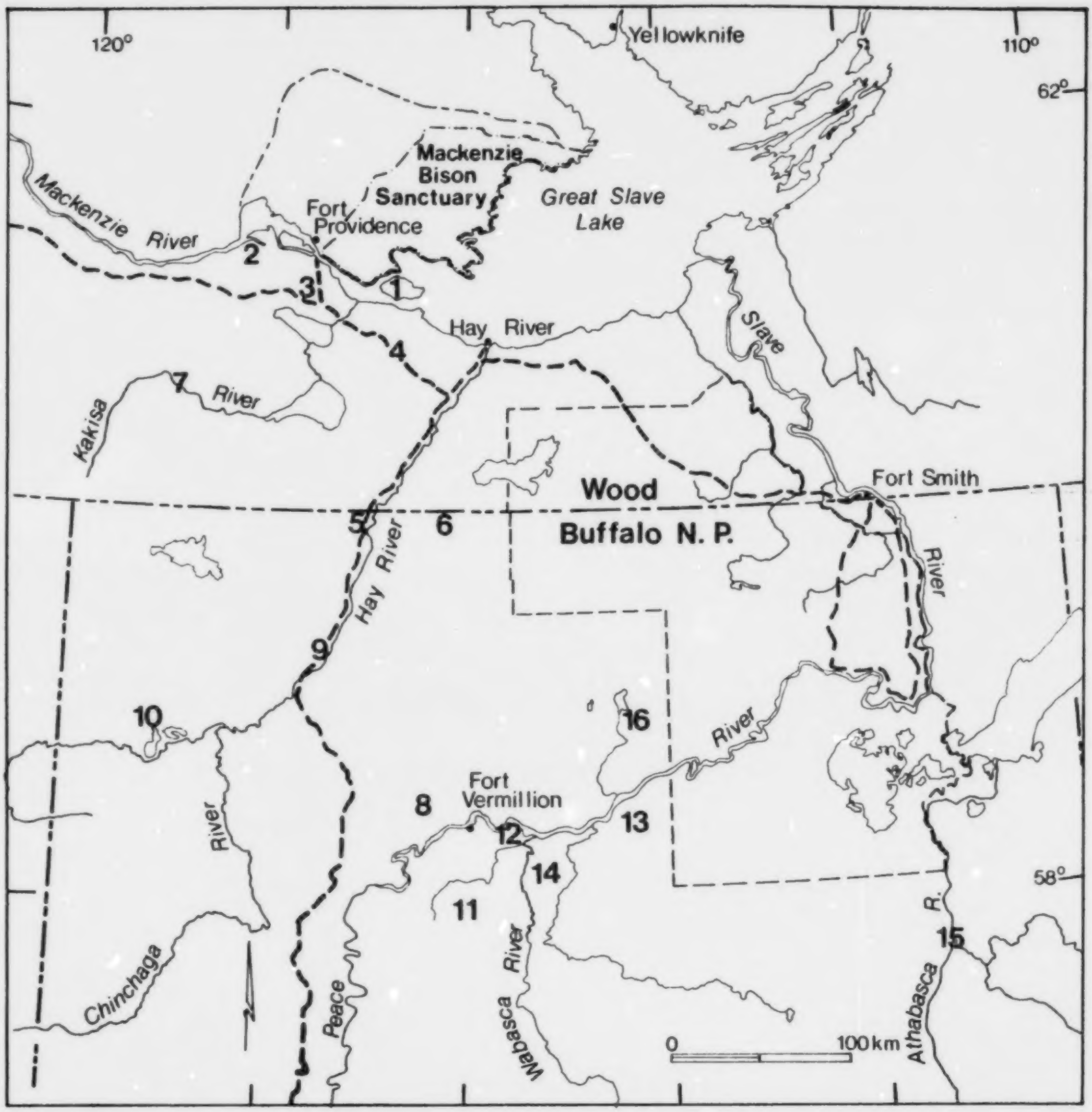
5.0 SCOPE FOR RECOVERY WITHOUT DISEASE ERADICATION

5.1 The Risk And Impact Of Infection Of Bison With Tuberculosis And Brucellosis

The future productivity and viability of free-ranging herds of wood bison are jeopardized by the presence of the diseased bison herds in and around Wood Buffalo National Park. The Mackenzie herd is particularly at risk of acquiring brucellosis and tuberculosis present in the infected bison herds. In the presence of primary reservoirs, other wildlife species can contract the diseases and may be of secondary importance as mechanical or biological vectors (Tessaro 1988). The Bison Disease Task Force (1988) pointed out that special circumstances are required for infection of dissimilar hosts and a dissimilar host is unlikely to spread the diseases. The most important modes of transmission for both diseases in cattle and bison involve direct or indirect contact between infected and noninfected bison and with contaminated feed and water.

Mature male bison are the initial dispersers and colonizers of new habitat (Gates and Larter 1989, Meagher 1989). A radio telemetry study of the movements of peripheral males in the Mills Lake area of the Mackenzie herd's range provided some insight into the question of whether or not such males ever return to core population centres (C. Gates, unpubl. data). In March 1989, five males were radio collared near Mills Lake, located west of Fort Providence and north of the Mackenzie River, NWT. Breeding females are not present in this area. Before the rut in July all of the males had moved to areas occupied by female herds near Mink Lake and in the Mackenzie Bison Sanctuary. One male moved a straight line distance of 120 km. This example clearly illustrates that mature males located considerable distances from herd concentrations, may nevertheless be integral herd members and therefore can serve as a bridge between non-infected and infected populations.

Bison of uncertain origin and disease status are scattered at low density throughout northern Alberta and southern NWT (Fig. 2). The largest herds are located near Wood Buffalo National Park, east of Fort Vermilion, at Wentzel Lake (site 16, Fig. 2), in the area between the Wabasca and Mikkawa Rivers (site 14) and along the Firebag River south of the Park (site 15). Disease testing has been undertaken at only three locations (sites 13, 14 and 16 in Fig. 2) (S. Tessaro, pers. comm). One of two bison collected near site 13 in February 1985 was culture positive for brucella. One of four bison collected near site 14 in March 1989 had lesions in bronchiolar lymph nodes that were consistent with tuberculosis and acid-fast organisms (a characteristic of Mycobacterium bovis) were identified. In February 1988


Yellowknife
120°
110°
62°
58°
Mackenzie Bison Sanctuary
Great Slave Lake
Mackenzie River
Fort Providence
Hay River
Slave
Kakisa
River
Fort Smith
Wood Buffalo N. P.
River
Hay River
Fort Vermillion
River
River
Chinchaga
Peace
Wabasca River
Athabasca R.
0
100km
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16

LEGEND (Map number - Description, Date, Reference)

1 - 2 bulls, August 1982 Canadian Coast Guard
2 - 4 bulls, September 1986, L. Antoine
3 - 2 bulls, September 1986, 2 hunters
4 - 3 bulls, May 1989, Tourist
5 - 1 bull, December 1988, Renewable Resource Officer
6 - Small herd (cows & calves), August 1981, Alberta Forest Service
7 - 1 bull, 1976, J. Van Camp
8 - 5 bulls, 1982, Gainer (1985)
9 - 2 bulls, 1980, R. Gainer
- 1 bull, 1983, R. Gainer
- 2 bulls, winter 1982, R. Garlic

10 - 1 bull, March 1984, H. Reynolds
11 - 5 bison, 1984, C. Friesen, Gainer (1985)
12 - 1 bull, 1984, Mr. Roberts
13 - 20 bison, - , Gainer (1985)
14 - 23 bison (adults), February 1988, S. Tessaro
- 17 bison, March 1989, S. Tessaro, R. McFetridge

15 - 20 bison, January 1984, Tessaro (1987)
16 - 24 bison, February 1988, S. Tessaro
- 19 bison, March 1989, S. Tessaro, R. McFetridge

Figure 2. Distribution of bison sightings reported since 1976 in the region west of Wood Buffalo National Park and south of the Mackenzie River.

six bison were collected at site 16. One of them showed a suspicious serologic reaction for brucellosis. While sample sizes were insufficient to determine disease prevalence, the existence of the diseases in bison outside of WBNP has been clearly demonstrated.

Infection of the Mackenzie population is a certainty over time, if the diseases continue to persist in infected populations in and around WBNP. Conditions that favour transmission of the diseases already exist.

Based on evidence provided to the Northern Diseased Bison Assessment Panel (1989) and from examples of attempts to control bison movements (Meagher 1989), there appears to be no risk free mechanism to confine the diseased bison.

Infection of healthy wood bison herds with tuberculosis and brucellosis poses a threat to the recovery of the wood bison and to economic and aesthetic values of the subspecies through the negative effects that the diseases have on productivity, morbidity and mortality, and on the ecosystem. Brucellosis causes reproductive loss in cattle by causing frequent returns to oestrous, temporary or permanent sterility, weak calves, abortion and loss of some females as a result of acute metritis associated with retained placentas (Broughton 1987). Localization of brucellae in testicles causes orchitis and sterility in advanced cases. Localization in joints causes suppurative arthritis. Specific research has not quantified the impact of brucellosis on bison productivity at the population level. However the pathogenesis and pathology of the disease in bison is similar to that in cattle and population effects are likely similar. Brucellosis has been suggested as a factor contributing to the poor calf production seen in bison in Wood Buffalo National Park and the Slave River Lowlands (Broughton 1987, Tessaro 1988).

Since brucellosis has been managed as an economically important factor in cattle production in many parts of the world, there is scant information on its importance to population dynamics in the absence of disease management. An example of chronically infected herds in Sudan illustrates the importance of the disease in unmanaged herds. Cattle herds in Sudan suffered from endemic infections of brucellosis that resulted in a 10% decrease in calf production, including abortion losses and reduction in fertility (McDermott 1987). The United States Department of Agriculture estimated an average abortion rate of 15% in cattle herds (Carpenter 1976). In the initial phase of infection in cattle, abortion storms are characteristic, with up to 80% loss of the calf crop in a previously unexposed herd.

Both diseases can cause severe debility. Generalized tuberculosis causes emaciation and ultimately death; pulmonary tuberculosis causes a reduction in lung function; brucella arthritis results in crippling, emaciation and death. Tessaro (1988) cites evidence that led him to the conclusion that a significant proportion of adult bison mortality attributed to wolves in WBNP is predisposed by disease. Messier (1989) concluded that the net effect of the diseases is likely a higher than normal killing rate of bison by wolves.

In addition to reducing the productivity of bison herds and causing animal suffering, the diseases affect the suitability of harvested bison for human consumption. Wastage of infected bison has been reported by bison hunters from Fort Smith and Fort Resolution, but the rate of abandoning carcasses is not documented. Hunters have reported leaving carcasses when they observed generalized tuberculosis, suppurative joint infections, swollen retropharyngeal lymph nodes and systemic brucellosis (C. Gates pers. comm.). Of 56 bison that were killed, butchered and utilized by native hunters, Tessaro (1988) determined that 24 (43%) had one or both of the zoonotic diseases. Since hunters show a preference for young bison, and the pathology of the diseases progresses with age, the severity of the diseases may be under-represented in hunter-killed animals.

Tubercular lesions were noted in 39% of 1,508 bison slaughtered in WBNP between 1952 and 1956 (Fuller 1959). Necropsy examinations in a 1959-60 slaughter revealed that 31 (14.2%) of 219 bison with tubercular lesions had the generalized form of the disease and the remaining animals had caseous or calcified lesions. Since at least those animals with generalized tuberculosis would be abandoned by hunters, the minimum rate of abandonment owing to infection with this disease would be the product of the infection rate and the rate of generalized tuberculosis, or about 5.5%, assuming random harvesting. Obvious tubercular or brucella lesions would result in additional abandonment depending on individual hunter attitudes.

In November 1964 and March 1965, 522 bison were shot near Grand Detour north of Fort Smith in an attempt to depopulate the area and stop further spread of anthrax from Hook Lake to WBNP (Novakowski 1965). Two hundred and eighty bison were necropsied of which 54 (19.3%) were condemned because of extensive disease lesions. This slaughter was probably the only truly random sample of the diseased bison population, since an effort was made to kill all bison encountered. It therefore provides the least biased estimate of the impact of the diseases on suitability for human consumption.

5.2 Scope For Growth Of Existing Herds

Mackenzie and EINP wood bison are the only herds that currently contribute to the minimum objective of the recovery program of four wild herds $\geq$ 200 in size. The Elk Island herd has attained the desired maximum size and further growth is managed by removing bison for other recovery projects. The Mackenzie population is the only free-ranging herd in the wood bison's historic range that exceeds the minimum required population size. The growth rate of the herd has slowed in recent years and the bison have occupied nearly all of the most favourable bison range west of Great Slave Lake (Gates and Larter 1989). The scope for further growth of the herd is unknown but with occupation of the last large area of suitable habitat near Mills Lake being expected in the near future, it is anticipated that further herd growth will be limited. While the herd is naturally regulated at the present time (a hunting quota of 40 is restricted to males), maintenance of moderate to high productivity will depend on active management. Further geographic expansion of breeding herds is expected to be limited by habitat availability. However, mature males are expected to disperse from population centres.

It is still too soon to predict if the Nahanni and Yukon herds will contribute to the minimum objective of the recovery program. However, bison in each of these areas are currently using habitats that were not evaluated in initial forecasts of range capability (Reynolds et al. 1980, Reynolds et al. 1982a, 1982b) and the potential for the herds to increase to 200 or more bison is unknown. Clearly, additional herds are required to assure the recovery of the wood bison in its historic range and to secure the subspecies against catastrophic events such as drownings, wildfire, and disease and to meet the delisting criteron for COSEWIC.

5.3 The Potential For Re-introducing Additional Herds

Human activities and development that are incompatible with the existence of large free-roaming wood bison herds continue to increase in the historic range of the wood bison. This results in continued alienation of the area available for this threatened subspecies and further diminishment of the potential for its recovery (Fig. 1). Only 2% of the historic range is occupied by healthy wood bison herds, and an additional 19% is potentially available under current constraints. Twenty five percent is unavailable owing to human activities and development. However, the greatest single factor affecting the availability of historic range and the potential for further recovery of the wood bison is the existence of the diseased herds of bison in and around WBNP. Although WBNP is only 6% of the historic range, the presence of the diseased bison in the park and adjacent area effectively precludes the establishment of healthy bison herds in a much larger area. Fifty-four percent of the historic range is unavailable because of the existence of diseased bison herds. This represents 72% of the area free of other conflicts in which it would be possible to establish free-ranging herds.

The most extensive, and highest quality ranges for wood bison exist in WBNP, with its rich delta, perched basins and historic network of bison habitat, and in the large meadows of the Slave River Lowlands. These areas are currently inhabited by diseased bison of uncertain taxonomic status. Therefore, the scope for recovery of healthy wood bison in these large areas is severely restricted because of the presence of the two diseases. Historic evidence of the existence of bison in the larger region in which the Park lies is found in names given to geographical features: Bison Lake, Buffalo Narrows, Wood Buffalo Lake and River, Buffalo Creek, Buffalo Head Hills. This vast region is largely devoid of bison. Where once the subspecies existed as an important natural element of the boreal forest ecosystem, the few free-ranging bison occurring there are viewed as undesirable fugitives of the wildlife management system.

An immediate example of the obstructive nature of the disease problem is its impact on the Hay-Zama herd. Although the initial plan called for release of the herd to the wild in 1988, the re-introduction of wood bison to northern Alberta has been postponed indefinitely because of the risk of infection with bovine tuberculosis and brucellosis from free-roaming bison. There will be no attempts made to re-establish wood bison in other areas in northern Alberta until the disease problem has been resolved. In the Northwest Territories, a policy of eradicating any bison south of the Mackenzie River was established in 1987 to reduce the risk of infection of the Mackenzie wood bison herd. Re-occupation of this large area by wood bison is precluded by this policy.

It is apparent that, under the present circumstances, the only new potential site available for re-establishing wood bison within historic range is in the northeast part of British Columbia, in the Liard River drainage, as identified by the British Columbia Wildlife Branch. The capability of the area to support wood bison is not known.

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6.0 SCOPE FOR RECOVERY WITH DISEASE ERADICATION

6.1 Scope For Recovery

Elimination of the two diseases in the region would remove the largest single obstacle to the recovery of wood bison and would increase the potential for reestablishing healthy wood bison herds in an additional 54% of their historic range (Fig. 1). The expanded region includes the highest quality range for the subspecies and the core area of the historic range. In northern Alberta, outside of WBNP, the full potential for recovery was estimated to be 4000 head (Alberta Fish and Wildlife 1989). In the Slave River Lowlands, wood bison would be expected to increase to a level of at least that present in 1970, approximately 2000 head (Van Camp and Calef 1987), although further recovery may be possible if the causes of the decline there are managed. In WBNP complete replacement of the existing population would involve 3000 to 4000 bison, but recovery to the 1972 level would provide a population of approximately 9000 head (Carbyn et al. 1989). The habitat potential for bison in the NWT west of WBNP and south of the Mackenzie River is unknown. A conservative estimate of the recovery potential throughout the northern ranges after elimination of the diseases is 15000 wood bison.

6.2 Salvage Of Wood Bison From Diseased Populations

The extent of introgression of plains bison genes into the indigenous population of wood bison in northern Canada during the 1920's is poorly understood. Soon after the plains bison were introduced it was thought that the wood bison had been lost through hybridization (Soper 1941). However the extent of gene flow into the wood bison population into the Nyarling River area of northwestern WBNP was evidently slight, as bison in that area were classified as morphologically representative of wood bison (Banfield and Novakowski 1960) as were descendants of bison salvaged from the area in 1963 and 1965 (van Zyll de Jong 1986). van Zyll de Jong (1986) hypothesized that a cline of phenotypic frequencies should exist between northern and southern subpopulations in the enzootic zone, and that bison in the Hay Camp and Lake Claire areas would be expected to show the greatest similarity to plains bison. Further taxonomic evaluation of these populations is required. Van Camp (1989) argued that bison in the Hook Lake herd, located in the Slave River Lowlands, are the descendants of a relict population of wood bison and that they may have suffered even less introgression of plains bison genes than occurred in the Nyarling River subpopulation, based on historical anecdotes, external morphology and behaviourial observations.

Recognized existing herds of wood bison are derived from a small number of founding stock, 16 in the case of the Mackenzie herd (two died during the first year after release), and 24 in the case of the Elk Island National Park herd. When a population is reduced to a few individuals there is a risk of a genetic bottleneck, by which a reduction in genetic diversity or an increase in homozygosity may result. In the short term, the consequence of a genetic bottleneck may be a decline in the vigour of individuals, hence reduced viability of the population. Olech (1987) reported the negative effect of continued inbreeding on reproductive performance of European bison herds (Bison bonasus). In the long term, a loss of genetic diversity may result in reduced flexibility of a population to respond or adapt to environmental changes. While the vitality of existing populations of wood bison indicates that they have suffered no apparent serious effects of reduced genetic variability as a result of passing through a bottleneck, the risk of future or unobserved deleterious effects warrants close examination. The possibility to broaden the diversity of the genetic base of modern wood bison by salvaging bison from additional sources outside of the Nyarling River area, if local populations are found to conform taxonomically to athabascae, should be evaluated.

Among the alternatives that the Task Force on Bison Diseases (1988, Executive Summary:x) identified for resolving the diseased bison problem was an option that included salvaging wood bison from areas in the enzootic zone which, with the addition of stock from EINP and the Mackenzie populations, would form the nucleus of disease-free breeding herds that would ultimately replace the diseased population. This option would provide the greatest benefit to the conservation of the genetic integrity of wood bison. The process for salvaging wood bison should involve the following sequential steps:

1. Thoroughly evaluate the feasibility and risk of salvaging wood bison from diseased herds.

   Agriculture Canada (1989:13-14) provided a brief outline of a protocol for eliminating the diseases from bison captured for genetic salvage. Their conclusion was that while salvaging wood bison could add to the diversity of the gene pool, the disease risks far outweigh the advantages. They cite the high prevalence of the diseases, the potential for latency of the diseases and the imperfect sensitivity of tests used to detect brucellosis and tuberculosis infections. Conversely, salvaging disease-free wood bison has been completed successfully on two previous occasions, in 1963 and again in 1965. The conservation merit and feasibility of salvaging wood bison deserves more critical evaluation.

2. Determine if subpopulations of bison exist that conform to taxonomic criteria for pre-1925 or modern wood bison.

   If the assessment of feasibility and risk supports the salvage of wood bison, then an evaluation of the taxonomic affiliation of subpopulations separate from the Nyarling River area should be undertaken. Morphometric criteria and the analyses of van Zyll de Jong (1986) can serve as a useful and recognized standard. New technologies such as blood typing (Stormont 1987) and DNA restriction fragment analysis (Bork _et_ _al_. 1989) offer promise as improved methods for distinguishing between subspecies and populations, but will take some time to develop and to become accepted by taxonomists. Since the time line for deciding on a course of action to resolve the diseased bison situation is short, i.e. before the disease spreads to the Mackenzie population or benefits to resource users erode further, it would be more appropriate to employ the time honoured morphometric analyses currently accepted by taxonomists to evaluate bison herds rather than waiting for new technologies to be developed and accepted.

3. Evaluate the most efficient method of salvaging wood bison from infected herds determined to be representative wood bison.

   At least two approaches for salvaging genetic material from brucellosis and tuberculosis infected wood bison populations need to be evaluated. The conventional approach would involve the procedure employed in 1963 and 1965 during the first wood bison salvage project. In brief, the procedure would involve rounding up bison, subjecting them to disease testing, then disposing of reactors. With intensive retesting at intervals and isolation techniques, the diseases may be eliminated with certainty over a period of several generations (Agriculture Canada 1989: 13-14). Alternatively, genetic salvage may be achieved by procuring semen from as many mature males as deemed feasible and with cryostorage and artificial fertilization techniques captive wood bison females could be used in a breeding program to preserve genetic material. Chemical immobilization and semen collection have been successfully carried out with the Mackenzie population (C. Gates, pers comm.) and artificial fertilization is commonly practised in domestic animal husbandry. The potential risk of disease transmission with infected semen would have to be evaluated.

7.0 IMPLICATIONS OF DISEASE ERADICATION AND WOOD BISON RECOVERY

7.1 National And International Implications

Canada, as an active participant in international committees and agreements concerned with global conservation, subscribes to certain basic principles respecting conservation of genetic diversity, the maintenance of natural ecosystems,and sustainable development. Within Canada, COSEWIC identifies species in need of protective measures and interacts with RENEW in promoting the recovery of wildlife in danger of extinction.

With the repopulation of northern Alberta, southern NWT, WBNP and the Slave River Lowlands with healthy wood bison following elimination of the diseases, the risk of extinction of the subspecies could be dismissed. The wood bison could be removed from the list of endangered species of wildlife in Canada, thereby aligning practice with international principles and adding to Canada's reputation as a good steward of its natural resources.

A policy in support of the elimination of diseases and recovery of wood bison in the enzootic zone would be consistent with principles of the WCS endorsed by the government of Canada. Such a policy would enhance the conservation of genetic diversity of bison and provide much broader opportunities for sustainable development of the wood bison as a renewable resource, in contrast to the limited opportunities that exist at present.

In a draft Action Plan For North American Bison, the Bison Specialist Group of the Species Survival Commission of IUCN calls for eliminating the diseased bison in WBNP and surrounding area and replacing them with disease free wood bison.

The wood bison is currently listed on Appendix I of the Convention on International Trade In Endangered Species (CITES). While the subspecies has never been in danger of extinction through trade, international control on potential trade was deemed necessary in 1977 to prevent such activities from endangering the survival of the wood bison. This protection is an impediment to economic use of wood bison herds where such use is consistent with the principle of sustainable development. In order to secure downlisting on the CITES Appendices, it will likely be necessary to achieve an enduring solution to the bison disease issue which would also result in major progress in wood bison conservation and recovery.

WBNP was originally created in 1922 to protect the wood bison and its habitat. Over time, an array of other natural features were identified to more broadly define its significance as a national park. The Park was designated a World Heritage Site by UNESCO in 1985 in part based on the bison herds that roam there. It is indeed unfortunate that the bison herds presently being protected in the park are diseased and severely limit the recovery of a recognized threatened species, the wood bison. With restoration of healthy wood bison herds, WBNP would once again serve its original purpose and the heritage value of the Park would be strongly reinforced.

The rate of growth exhibited by the Mackenzie wood bison herd provides an encouraging example of how rapidly recovery could proceed if the main obstacle to re-introducing the subspecies is mitigated. With supportive changes in government policy and direct action, the recovery of wood bison throughout northern Alberta, southern NWT, in WBNP and the Slave River Lowlands could be effected within the next two decades. Without eradication of the diseases there is little scope for further recovery of this magnificent and uniquely Canadian subspecies of bison. Given existing conditions, it is unlikely that wood bison will ever be removed from the COSEWIC list of endangered species. With the past 27 years of effort, the wood bison has achieved the same status of recovery that it had reached in 1925, before the introduction of diseased plains bison. The opportunity to correct a 65 year old error is clearly before us. History will judge if we have learned from the lessons of 1925.

7.2 Economic Implications

Slaughters of bison in WBNP to provide meat for Roman Catholic missions and northern communities and for disease control, were carried out between 1929 and 1974 (Tessaro 1988). The slaughter program intensified beginning in 1950 as the objectives broadened to include not only providing an inexpensive meat supply for native people in the region but to provide jobs and an economically viable bison meat sales operation for southern Canadian markets (Tessaro 1988). In 1954 a Management Plan for the Park was adopted that included culling tuberculin test reactors at the meat harvests (Stevens 1954). After brucellosis was discovered in 1955 a similar test and slaughter program was applied in the hope of lowering the incidence of that disease (Novakowski 1959). Selection of reactors for slaughter was stopped after 1961 as it was believed that the rate of infection was so high that it could not be reduced without draining the population of reproductive aged bison (Olson 1961). The last commercial slaughter in WBNP was carried out in 1967. In 1971 and 1974, field slaughters were permitted for the last time to provide meat for local native communities.

Public bison hunting has never been permitted in the Park. With the exception of wood bison at the Hay-Zama facility, bison wandering out of the Park or residing on Provincial Crown Lands in northern Alberta are considered to be non-wildlife, in the same legal category as plains bison. Hunting is not regulated and the number taken is poorly documented. Presently, there is no management of free-ranging bison in northern Alberta.

In the NWT, bison in the Slave River Lowlands were protected until 1955 when regulated sport hunting was first permitted. Two licensed outfitters operated in the Slave River Lowlands from 1959 to 1961, but hunting was closed in 1962 when the first known outbreak of anthrax occurred. Sport hunting was reinstated in 1968 for NWT residents and an outfitter was licensed to guide non-resident hunters in 1970. Bison became an important economic resource as well as a community symbol for Fort Smith and Fort Resolution.

After the last commercial slaughter of bison in WBNP the attention of hunters from Fort Smith and Fort Resolution was directed towards bison herds in the Slave River Lowlands (Van Camp 1987). On average, 179 bison were killed annually between 1969 and 1974. Although the bison population declined sharply, the rate of kill remained in the range of 4-10% per year until the late 1970's. Non-native hunting ceased in 1977. Hunting by Native people remains unregulated.

The Hook Lake herd on the east side of the Slave River declined from 1701 in 1971 (Van Camp and Calef 1987) to 183 in 1987 when a count was carried out by the NWT Department of Renewable Resources and the Fort Resolution Hunters and Trappers Association. There are probably fewer than 400 bison in the entire Slave River Lowlands today. While unregulated hunting is implicated as a factor in the decline in bison herds in the area, poor calf production and survival, infection with brucellosis and tuberculosis, adverse weather and wolf predation were noted as contributing factors that reduced the sustainable yield of the herds (Van Camp 1987).

At present, Fort Resolution residents harvest approximately 20 bison annually, according to reports from local Renewable Resource Officers. Bison hunting by Fort Smith residents is largely dependent on bison moving out of the Park. The greatest proportion of the harvest occurs during the fall and early winter. Local Renewable Resource officers reported that, on average, Fort Smith hunters kill between 20 and 40 bison annually. There is no active management in place for bison in the Slave River Lowlands.

The value of bison to the economies of Fort Smith and Fort Resolution has declined substantially since the late 1960's and without management intervention the herds can be expected to decline further to a point where they will contribute little to the local economy. Except for Fort Providence, Fort Resolution and Fort Smith, other communities in the historic range of the wood bison have realized little economic benefit from bison, though the potential exists if supportive management measures can be implemented.

Current government policies discourage the establishment of free-ranging bison herds owing to the risk that they may carry or contract tuberculosis or brucellosis from the infected herds. The lack of interest in managing bison in areas surrounding the Park results in increased pressure on the Park bison population as animals wandering out of the Park are subject to unregulated harvesting.

With disease eradication and recovery of healthy wood bison herds a full spectrum of economic opportunities could be realized, including increased tourism, meat harvesting and outfitting enterprises for trophy hunting. Populations of wood bison could expand in suitable habitats peripheral to WBNP through both emigration and re-introduction, giving rise to sustainable resource use activities in a large section of northern Alberta, and the southern NWT.

Action to eradicate the diseases and to permit broad scale recovery of wood bison, free of these specific diseases, would be consistent with the objectives of the RENEW Strategy and the principles of the WCS.

7.3 Implications For Ecosystem Health

Bison can be described as a keystone species in sections of the boreal forest where suitable habitat exists. They occupy a niche that no other native herbivore can, meadows dominated by coarse grasses and sedges. They are a key element in the dynamic interplay between other native large mammals, serving as a major prey item for wolves. Outside WBNP and the Slave River Lowlands, the wood bison has been effectively absent since the end of the last century. Recent efforts made to re-establish this native subspecies of bison have made limited progress. Further recovery of the wood bison is possible in a large area in northern Alberta and southern NWT if the disease situation is satisfactorily resolved.

Like chemical pollutants injected through the waterways into the northern ecosystem, the diseases tuberculosis and brucellosis are foreign, man-induced agents that alter the natural functioning of the system. Even in WBNP the protected bison population is not naturally regulated owing to the presence of diseases that affect reproduction, morbidity and mortality. The relationship between wolves and infected bison herds in the enzootic zone is likely unique. The diseases afford predators the advantage of an unusually high abundance of vulnerable prey that in turn supports a higher than normal ratio of predators to prey.

Where death caused by disease is rare in other large herbivore populations in Canada, generalized tuberculosis may annually kill about 6% of bison in WBNP (Fuller 1962).

Neither WBNP nor the enzootic zone can be treated as an ecological unit separate from the larger region surrounding them, where the restoration of a complete natural assemblage of indigenous large mammals is of aesthetic and economic value to the Canadian public. Ogilvie (1979) issued a challenge that applies to the decision concerning the fate of the broad ecosystem of which the wood bison was once an important element:

> "It is an easy matter in retrospect to condemn some of the less fortunate decisions made during the preservation process (such as the shipment of plains bison to the country of the wood buffalo) but possibly a more important task before us is to ensure that significant contributions to species conservation and to the protection of landscape and habitat remain part of our heritage as well as being our commitment to the future."

In this context, the irony of possibly preserving an ecosystem altered by humans at the expense of restoring a healthy ecosystem in a much larger region is self evident.

The frequently expressed idea of "correcting past wrongs" is consistent with evolving public support for conservation, restoration, maintenance and wise use of natural resources. Public interest in the northern diseased bison debate is high. Not since the first two decades of this century has there been an opportunity to restore the wood bison to its former role within a healthy, productive and intact ecosystem in a broad section of the boreal forest. The consequence of failing to achieve this goal when it is within our reach would indeed be a sad legacy to leave for future generations.

8.0 LITERATURE CITED

Agriculture Canada. 1989. Agriculture Canada's submission to the Northern Diseased Bison Assessment Panel. Unpublished report.

Alberta Fish and Wildlife. 1989. Alberta Fish and Wildlife reply to Northern Diseased Bison Assessment Panel information requirements. Unpublished manuscript.

Allen, J. A. 1876. The American bisons, living and extinct. Mem. Mus. Comp. Zool. Harvard College. 1974. Arno Press, New York. 245 pp.

Banfield, A.W.F.and N.S. Novakowski. 1960. The survival of the wood bison (Bison athabascae Rhoads) in the Northwest Territories. Natl. Mus. Can. Nat. Hist. Pap., no. 8. 6 pp.

Bison Disease Task Force. 1988. Evaluation of brucellosis and tuberculosis in bison in northern Canada. Prepared for the Bison Disease Steering Committee. Available from Agriculture Canada, Ottawa.

Bork, A., C. Strobeck, F. Yeh, R. Hudson and R. Salmon. 1989. Genetic relationships of wood and plains bison based on restriction fragment length polymorphisms. (draft manuscript).

Broughton, E. 1987. Diseases affecting bison. Pages 34-38 In: Reynolds H.W.; Hawley, A.W.L., eds. Bison ecology in relation to agricultural development in the Slave River lowlands, NWT. Occ. Pap. No. 63. Can. Wildl. Serv. Minister of Supply and Services, Canada 1987. Cat. No. CW69-1/63E. 74 pp.

Carbyn, L. N., D. Huisman, E. Street and D. Anions. 1989. An analysis of the decline of bison in Wood Buffalo National Park from 1971-1981 and a review of the status to 1989. Unpubl. Rep. CWS. 268 pp.

Carpenter, T. E. 1976. The application of benefit-cost analysis to compare alternative approaches to the brucellosis problem in California. In: New techniques in veterinary epidemiology and economics. Proceedings of an International Symposium. University of Reading, Reading, England. Pp. 122-125.

Chambers, S.M. and J.W. Bayless. 1983. Chapter 21: Systematics, conservation and the measurement of genetic diversity. Pages 349-363 In: Schoenwald-Coz, C. M., S. M. Chambers, B.

120

MacBryde and L. Thomas Eds. Genetics and Conservation. A reference for managing wild animal and plant populations. The Benjamin/Cummings Publishing Co. Inc. Don Mills, Ontario.

Choquette, L. P., J. F. Gallivan, J. L. Byrne and J. Pilipavises. 1961. Parasites and diseases of bison in Canada I. Tuberculosis and some other pathological conditions in bison at Wood Buffalo and Elk Island National Parks in the fall and winter of 1959-60. Can. Vet. J. 2:168-174.

Corner, A. H. and R. Connell. 1958. Brucellosis in bison, elk and moose in Elk Island National Park, Alberta, Canada. Can. J. Comp. Med. 22:9-21.

Flerov, C. C. 1965. Comparative craniology of recent representatives of the genus bison. Byull. Mosk. O Va Ispyt Prir. Old Bio. 70:1-17.

Fuller, W. A. 1959. The biology and management of the bison of Wood Buffalo National Park. PhD Thesis, University of Wisconsin, 1959.

Fuller, W.A. 1962. The biology and management of the bison of Wood Buffalo National Park. Can. Wildl. Serv. Wildl. Manage. Bull. Ser. 1(16). 52 pp.

Gates, C.C. and N. C. Larter 1989. Growth and dispersal of an erupting large herbivore population in northern Canada: the Mackenzie wood bison (Bison bison athabascae). Arctic (submitted).

Geist, V.and P. Karsten. 1977. The wood bison (Bison bison athabascae Rhoads) in relation to hypotheses on the origin of the American bison (Bison bison Linnaeus). Z. Saugetierk. 42:119-127.

Graham, M. 1924. Finding range for Canada's buffalo. Can. Field- Nat. 38:189.

Harper, F. 1925. Letter to the editor of the Canadian Field-Naturalist. Can. Field-Nat. 39:45.

Hadwen, S. 1942. Tuberculosis in the buffalo. J. Amer. Vet. Med. Assoc. 100:19-22.

Hearne, S. 1795. A journey from Prince of Wales' Fort in Hudson's Bay to the northern ocean, 1769, 1770, 1771, 1772. Edited with an introduction by Richard Glover. Toronto. MacMillan, 1958. 301 pp.

Hewitt, C.G. 1921. The conservation of the wildlife of Canada.

Scribners, New York. 344 pp.

Howell, A.B. 1925. Letter to the editor of the Canadian Field - Naturalist from the Corresponding Secretary of the American Society of Mammalogists, 13 April 1925. Can. Field-Nat. 39:118.

Karsten, P. 1975. Don't be buffaloed ... by a bison: history of Alberta herds. Dinny's Digest, Calgary Zool. Soc. 2:3-13.

Lothian, W.F. 1979. A history of Canada's national parks. Volume III. Parks Can., Supply and Serv. Can., Ottawa. Cat. No. R62-110/3-1979. 118 pp.

Lothian, W.F. 1981. A history of Canada's national parks. Volume IV. Parks Can., Supply and Serv. Can., Ottawa. Cat. No. R62-110/4-1981E 154 pp.

MacGregor, J.G. 1952. The land of twelve foot Davis. (A history of the Peace River Country.) The Institute of Applied Art, Ltd. Edmonton. 394 pp.

McDermott, J. J. 1987. A cross-sectional cattle diseases study in Congor Rural Council, southern Sudan. Part I. Prevention estimates and age, sex and breed associations for brucellosis and contagious bovine pleuro-pneumonia. Part II. Brucellosis in cows, associated factors, impact on production and disease control considerations. Preventive Vet. Med. 5:111-132.

Messier, F. 1989. Effects of bison population changes on wolf-prey dynamics in and around Wood Buffalo National Park. Unpubl. report. Prepared for the Northern Diseased Bison Environmental Assessment Panel.29 pp.

Meagher, M. 1989. Evaluation of boundary control for bison of Yellowstone National Park. Wildl. Soc. Bull. 17:15-19.

Mitchell, R.B. 1976. A review of bison management, Wood Buffalo National Park 1922-1976. Section B:1-43 In: Stelfox, J.G., comp. Wood Buffalo National Park Bison Research: 1972-1976. 1976 Annu. Rep. prep. for Parks Canada by Can. Wild. Serv., Edmonton.

Northern Diseased Bison Assessment Panel. 1989. Compendium of government submissions and technical specialist reports in response to the panel information requests document. Federal Environment Assessment and Review Office, Vancouver.

Novakowski, N. 1959. Report on studies on bison in Canada. Aerial resurvey of the higher density bison areas in Wood Buffalo National Park and the Northwest Territories. Canadian

122

Wildlife Service, unpubl. rep. No. CWS C883. 5 pp. & map.

Novakowski, N. 1965. Slaughter report, Grand Detour 1964, 1965. Canadian Wildlife Service, unpubl. report. No. CWS C1105. 4 pp. 2 App.

Novakowski, N.S. and W.E. Stevens 1965. Survival of the wood bison (Bison bison athabascae Rhoads) in Canada. Paper presented to the 45th meeting of the American Society of Mammalogists, Winnipeg. 21 June 1965. 5 pp.

Ogilvie, W. 1893. Report on the Peace River and tributaries in 1891. Annu. Rep. Dep. Interior Canada for 1892, pt. 7. 44 pp.

Ogilvie, S. 1979. The park buffalo. Being an account of the role of Canada's national parks in the preservation of the North American Bison. R. C. Scace, ed. Calgary/Banff Chapter, National and Provincial Parks Association of Canada, Calgary.

Olech, W. 1987. Analysis of inbreeding in European bison. Acta Theriol. 32:373-386.

Olson, B. E. 1961. Wood Buffalo National Park buffalo round-up: testing and slaughter program, 1958-1959. Parks Canada, unpubl. report.

Raup, H.M. 1933. Range conditions in the Wood Buffalo Park of western Canada with notes on the history of the wood bison. Spec. Publ. Am. Comm. Int. Wildl. Prot. 1, no. 2. 52 pp.

Reynolds, H.W., J.R. McGillis and R.D. Glaholt. 1980. Range assessment of the Liard-South Nahanni Rivers region, NWT as habitat for wood bison. Unpubl. Rep., Can. Wildl. Serv., Edmonton. 39 pp.

Reynolds, H.W., R.D. Glaholt and A.W.L. Hawley. 1982a. Chapter 49.Bison (Bison bison). Pages 972-1007 In: Chapman, J.A.; Feldhamer, G.A., eds. Wild Mammals of North America. Biology. Management. Economics. The Johns Hopkins Univ. Press, Baltimore. 1147 pp.

Reynolds, H.W. J.R. McGillis and R.D. Glaholt. 1982b. Range assessment of the Nisling River valley, Yukon Territory as habitat for wood bison. Unpubl. Rep., Can. Wildl. Serv., Edmonton. 64 pp.

Rhoads, S.N. 1897. Notes on living and extinct species of North American Bovidae. Proc. Acad. Nat. Sci. Philadelphia. 49:483-502.

Rowe, J.S. 1972. Forest regions of Canada. Dep. Environ., Can. For. Serv. Publ. No. 1300. 172 pp. and map.

Saunders, W.E. 1925. Letter to the editor of the Canadian Field Naturalist. Can. Field-Nat. 39:118.

Schultz, J. 1888. The Great Mackenzie Basin. Rep. of the Select Committee of the Senate Appointed to enquire into the Resources of the Great Mackenzie Basin. *In*: Raup, H.M. 1933. Range conditions in the Wood Buffalo Park of Western Canada with notes on the history of the wood bison. Spec. Publ. of Comm. Int. Wildl. Prot. 1, no. 2. 52 pp.

Seibert, F.V. 1925. Some notes on Canada's so-called wood buffalo. Can. Field-Nat. 39:204-206.

Seton, E.T. 1886. The wood buffalo. Proceedings of the Canadian Institute 31:114-117.

Skinner, M.F.; Kaisen, O.C. 1947. The fossil *Bison* of Alaska and preliminary revision of the genus. Bull. Am. Mus. Nat. Hist. 89:123-256.

Soper, J.D. 1941. History, range, and home life of the northern bison. Ecol. Monogr. 11:349-412.

Stevens, W. 1954. Bison report, September 1954. Parks Canada, unpubl. report.

Stormont, C. 1987.What do we know about bison genetics? Pp. 40-46 *In* Proc. N. Amer. Bison Workshop. U.S. Fish and Wildl. Serv.

Tessaro, S. 1986. The existing and potential importance of brucellosis and tuberculosis in Canadian wildlife: a review. Can. Vet. J. 27:119-124.

Tessaro, S. 1986. The existing and potential importance of brucellosis and tuberculosis in Canadian wildlife: A review. Can. Vet. J. 27:119-124.

Tessaro, S. 1988. A descriptive and epizootiologic study of brucellosis and tuberculosis in bison in northern Canada. Ph.D. Thesis, University of Saskatchewan.

Van Camp, J. 1987. Predation on bison. Pages 25-33 *In*: Reynolds,H.W.; Hawley, A.W.L., eds. Bison ecology in relation to agricultural development in the Slave River lowlands, NWT. Occ. Pap. No. 63. Can. Wildl. Serv. Minister of Supply and Services Canada 1987. Cat. No. CW69-1/63E. 74 pp.

Van Camp, J. 1989. A surviving herd of endangered wood bison at

Hook Lake, N.W.T.? Arctic 42:314-322.

Van Camp, J. and G. Calef. 1987. Population dynamics of bison. Pages 21-24 *IN*: Reynolds,H.W.; Hawley, A.W.L., eds. Bison ecology in relation to agricultural development in the Slave River lowlands, NWT. Occ. Pap. No. 63. Can. Wildl. Serv. Minister of Supply and Services Canada 1987. Cat. No. CW69-1/63E. 74 pp.

van Zyll de Jong, C.G. 1986. A systematic study of Recent Bison, with particular consideration of the wood bison (*Bison bison athabascae* Rhoads 1898). Publ. in Nat. Sci. No. 6., Natl. Mus. of Nat. Sci. Ottawa. 69 pp.

Wood Bison Recovery Team. 1987. Status report on endangered wildlife in Canada: Wood bison. COSEWIC, Canadian Wildlife Service, Ottawa.

Received
Jan 25 10:30p
Edmonton

NORTHERN DISEASED BISON: A REBUTTAL OF AGRICULTURE CANADA'S ARGUMENTS TO ELIMINATE BISON FROM WOOD BUFFALO NATIONAL PARK.

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> "I beseech thee, in the bowels of Christ, think it possible that thee might be mistaken."
>
> Oliver Cromwell, Carlyle, September 1643

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SUMMARY In 1925 the bison of Buffalo National Park at Wainwright, Alberta, fell victim to encroaching agriculture and bureaucratic blunders. Despite scientific advice to the contrary, most of these plains bison were shipped north to Wood Buffalo National Park where they hybridized with wood bison and introduced bovine diseases they had been infected with in Alberta.

Is history to be repeated?

Heeding the cattle industry, Agriculture Canada is calling for a removal of the "diseased" bison of WBNP. These "hybrids", and by implication "worthless" specimens, are to be replaced with disease free "wood bison" emanating from animals captured in the 1963 and 1965 at the Nyarling River. This - seemingly - sensible proposal is based on the assumption that Agriculture Canada will succeed in eradicating bovine diseases _absolutely_ in wild bison, a feat it has failed in with domestic cattle. So has the U.S. Department of Agriculture in over 50 years of trying; brucellosis and bovine tuberculosis outbreaks continue sporadically in the very states noted for their strict enforcement of rules. _Brucella abortus_, as expected, has spread in WBNP from bison to moose, wolves and foxes; other potential vectors (hares, ravens, domestic dogs) remain to be examined. _Brucella suis_ biotype 4, apparently not on Agriculture Canada's hit list, is found in migratory caribou. With the land south of WBNP cleared of forest and changed to cattle pasture, ecological conditions favouring elk, white-tailed deer and coyote would form a "bridge for diseases" between the parks wildlife and domestic stock. As the

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only continuously wild, large herd of bison in North America, the "worthless" hybrid bison of WBNP contain the entire wood bison gene pool. They are to be replaced with the impoverished, distorted gene pool of the Nyarling River bison. This gene pool has been subject to founder effect, genetic drift, maternal effect and male dominance effect. Nyarling River bison are, wrongly, assumed to be nearly pure "wood bison". Individual Nyarling River bison cannot be distinguished genetically from Canadian plains bison. This is not surprising. There is good evidence that Nyarling River bison had met the introduced plains bison from the south of the park; wood bison and plains bison met historically on the Peace River as late as 1866; these subspecies segregated only recently (Altithermal) and incompletely. The 1925 hybridization, while a cultural tragedy, is not a biological tragedy and comparable to the many crosses between subspecies in North America. The taxonomy underlying current bison conservation plans, as well as these plans, require serious reconsideration. Of the taxonomic criteria applied only some dealing with coat characteristics are valid; morphometric analysis confounds genetic, epistatic, environmental and statistical variation. In captivity, wood bison feature the same chaps on the front legs and hair patterns on the head and beard as do plains bison. Wood and plains bison are good ecotypes, but are barely distinct as subspecies. The WBNP bison should be designated Bison bison athabascae to conform with the naming of other forms where some integration is recorded, such as in Stone's sheep or mule deer.

Moreover, maintaining a "pure" wood bison herd in WBNP would be futile with Agriculture Canada's support of the game ranching industry at the borders of the park. Domesticated bison would escape private ranches as has happened in northern British Columbia where feral bison are currently multiplying, threatening the "wood bison" introduction on the Liard River. Agriculture Canada's proposal is based on a questionable taxonomy of bison, would destroy the most important gene pool of the species Bison bison, would elevate the conservation of genetically impoverished phenotypes over a species genotype, and would be futile in both its aims, abolishing bovine diseases and maintaining a pure "wood bison" stock in WBNP. The heavy wolf predation on WBNP bison in the last decade is expected to reduce the incidents and virulence of bovine diseases and, over time, lead to their extinction. Thus the "disease problem" is quite likely to solve itself with the status quo.

INTRODUCTION.

In the fateful year of 1989 Canada's free roaming bison approached a cross road. Agricultural interests, aided by federal, provincial and territorial wildlife agencies advanced a plan to exterminate the last wild herd of bisons in North America, the bison of Wood Buffalo National Park. Thereafter, these bisons allegedly of worthless hybrid stock and cariers of bovine tuberculosis and brucellosis, would be replaced by "wood bison" free of these diseases. Agriculture Canada is concerned not only with bovine diseases whose existence or the perception thereof might be damaging to cattle exports, but also with encouraging the ranching of cattle, captive bison and elk close to the southern border of WBNP. The Bison Disease Task Force was struck to deal with matter of information while The federal Environmental Assessment Review Office came into action to hold public hearings on the matter early in 1990.

This cannot be the place to review Canada's management of bison in Wood Buffalo National Park and I point for further reading to Hewitt (1921), Soper (1941), Banfield and Novakowski (1960), Fuller (1966), Roe (1970), McHugh (1972), Carbyn et al. (1989) and the Bison Task Force's Report. We must take cognisance that the bison in Wood Buffalo National Park are hybrids of two subspecies, the indigenous wood bison (*Bison bison athabascae*) and the Plains bison (*Bison bison bison*). The latter were introduced there from what was then Buffalo National Park near Wainwright, Alberta, commencing June 25, 1925. Eventually some

6,673 plains bisons, mainly yearlings and two year olds, were shipped to WBNP. The plains bison appear to have been the carriers of cattle diseases, namely bovine tuberculosis and brucellosis (Honess and Winter 1956; McHugh 1972). These diseases were found in the past decades (1947-1974) to infect from 4-62% of the bison sampled in the park, depending on technique, sample size, circumstances and type of disease (p.3-5/6 Bison Task Force Report).

It is argued by Agriculture Canada, that the extant bisons in WBNP are undesirable for agriculture and for conservation for two reasons: they are (1) hybrids compared to the "pure" wood bison now in Elk Island Park or the Mackenzie Bison Sanctuary (MBS), and (2) the hybrids are carriers of bovine tuberculosis and *Brucella abortus*, and are thus a danger to the cattle industry. It proposes the removal of the bison and their replacement with what are allegedly "wood bison".

It is my contention that both arguments are untenable, that the removal option is not only highly damaging to bison conservation but also utterly futile, and that means other than the elimination of the WBNP bisons are available to safeguard Canada's cattle ranching industry. I shall focus here primarily on the taxonomic and disease issues while recognizing that this critique of Agriculture Canada's position is far from exhaustive.

HYBRIDIZATION AND BISON TAXONOMY.

While the hybridization of bison in the WBNP in the 1920's was a preventable bureaucratic decision, and thus represents a

CULTURAL tragedy, the hybridization is a minor BIOLOGICAL tragedy - if any!

This is so because:

1. the two bison subspecies are so closely related, that no genetic distinction between individuals is currently possible. That is, one cannot assign a given individual bison to a given subspecies on the basis of unique genetic markers despite examinations of chromosomes (Ying and Peden 1977), mitochondrial DNA (Cronin 1986), nuclear DNA (Bork et al. unpublished), and blood proteins (Peden and Kraay 1979; see also the review by Berg 1989 and the unpublished ms. by Bork et al.). This does not dispute the findings of Peden and Kraay (1979) and Bork et al. that some differences in allele frequencies exist between the "wood" and various populations of "plains" bison. Great differences exist in blood typing reagents and carbonic anhydrase alleles between so-called plains and wood bison. However, differences just as great exist between different populations of plains bison that originated from the same limited stock at the turn of the century (Peden and Kraay 1979).

The genetic analysis of bison subspecies are done on the assumption that the findings represent evolved differences, possibly related to differences in adaptations. However, only Bork et al. made this explicit. Unfortunately, they focus on differences in body size on the assumption (unwarranted, see below) that the body size differences have a genetic basis; they assumed that wood bison are obligatorily, not facultatively larger. The strong genetic divergence between salvaged populations reflects probably more than the presumed evolved differences. They also include the "founder effect" (diminution of the genetic diversity due to taking of a small sample of bison to found herds), "genetic drift" (random fixation of alleles in small populations), the "maternal effect" (bison captured from the same herd have a high probability of being related by maternal decent), and the "male dominance effect" (disproportionate genetic contribution of the most dominant founder bull).

When a herd of, say, three bulls and 12 cows is assembled, then social competition between the bulls insures that only one bull will do virtually all the breeding. Moreover, he may continue breeding virtually all cows for a number of year. The dominant breeding bull may live to breed his daughters. Meanwhile his sons grow into large dominant bulls that displace the earlier bulls, as well as their father. For this reason small founder populations of bison would rapidly diverge and impoverish genetically. This factor has not been recognised and named, but "male dominance effect" might be an appropriate term. Given this effect genetic "pseudo subspecies" could be quickly generated!

The close genetic relationship between Canadian plains and "wood bison" would not be surprising even in the absence of hybridization for a number of reasons.

Current North American bison are most likely Siberian immigrants that spread south with megafaunal extinction along with other Siberians such as elk, moose, grizzly bear and man. That is, Siberian bison have been in North America for 11,000 years or less. While it has been hypothesized that plains bison are hybrids between indigenous American bison (Bison antiquus) and the invading Siberians (B. occidentalis) as discussed by van Zyll de Jong (1986) some fossil evidence suggests differently. It shows a distinct replacement of indigenous American bison by extant bison about 10,000 BP (Wilson and Churcher 1984). This supports the thesis that American Bison are of one origin as advanced by a number of authors as reviewed in van Zyll de Jong (1986), Geist (1971) and Geist and Karsten (1977) on the basis of zoo-geographic variation in social organs. The Siberian bison on the North American continent have been segregated into wood and plains bison, at best, since the Altithermal warm phase (about 8,000 years BP).

Moreover, there is also historic evidence that plains bison occasionally extended their movements into wood bison range. This happened along the Peace River and the last such influx of plains bison occurred apparently in 1866 (van Zyll de Jong 1986:50). This cannot be equated automatically with hybridization, but, taken over centuries it does suggest that hybridization was likely. Peace River bison had apparently retained their distinct appearance compared to Plains bison, but this could be in part an ecotypic effect. Although we are not well informed on the social system of female bison it is likely that, as in other ruminants, females are united into social units by common maternal decent.

If so, the bulk of plains bison sweeping into wood bison range would also depart, while stragglers would have a difficult time joining established wood bison social units and, as loners, would be at increased risk from predation.

The diagnostic characteristics of pelage and body shape of wood and plains bison were first described systematically by Geist and Karsten (1977) using living specimen in Elk Island National Park. Their descriptions were subsequently tested by van Zyll de Jong (1986) who accepted them with some reservations. These phenotypic differences were incompletely listed by Berg (1989) along with taxonomically invalid characteristics, such as body size and craniometric differences.

The use of craniometry and morphometry in taxonomy is like using a rubber tape to measure distance. These techniques confound genetic, epistatic, environmental and statistical variation, as well as homology and analogy. That is, while size and morphometry are good tools to segregate populations, they are inadequate tools to segregate taxa, that is groups of genetically distinct organisms as opposed to related forms living in different environments. Bones are very plastic in their growth changing dimensions with net nutrition and shape with dimension (allometry) and with muscular forces. Curiously, this old, and well-demonstrated knowledge, which is the very essence of the discipline of Animal Science and its "theory of centripetal growth", and of the practice of and research pertaining to orthodontics, has not been included in the practice of taxonomy.

Nor have taxonomists incorporated the finding, first proposed by Beninde (1937) based on transplanted red deer, and subsequently experimentally confirmed using passerine birds by James (1983), that different genotypes transplanted to the same environment converge on the resident phenotype.

This is not the place for a detailed review of this issue (see Geist 1978:116-144; 1989, and the 1989 (Vol.39, NO. 7) issue of Bio Science devoted to phenotype plasticity). It does, however, indicate that the segregation of wood and plains bison by van Zyll de Jong (1986) on morphometric grounds is not as definitive as one would like it to be. A glance at his paper shows that allometry was not considered in his methods. A quick check whether conspecifics differ in size is to check the length of tooth rows. Table 3 in van Zyll de Jong indicates that this length is virtually identical for all populations he studied. This indicates that wood and plains bisons are genetically of the same size. Teeth are tissues of "high growth priority" that tend to be fully developed almost irrespective of the environment. Size is thus not a taxonomic criterion segregating these subspecies. The differences in basilar skull length are substantial between the wood and plains bison samples. If so, then the shape of the skull and post-cranial skeletons will be much affected by allometric growth; the sensitive multivariate analysis cannot but show a significant difference here. Dr. van Zyll de Jong (1986) is troubled to what extent his work shows genetic differences. Unfortunately, some untenable ecological and empirical conclusions led him to trust his work more than is warranted. As shown below, he felt that wood bison retain their phenotypic characteristics in captivity. That is not true. Also, he felt that because morphometrically the original wood bison (collected when few were about), the Nyarling River specimens and the EINP specimens were so similar and distinct from current and historical plains bison, that the difference reflects genetic differences. That is an ecologically unacceptable conclusion because all current and historic wood bisons came from low density (expanding), non-migratory populations. That is, all of the wood bison had probably not only access to more resources for growth and development, but did not need to spend these resources in costly migration (there is a parallel to this in reindeer and caribou). Wood and plains bisons in EINP emphatically do not live in the same environment as van Zyll de Jong (1986) explicitly assumed. Consequently his morphometry, no matter how sophisticated, is confounded by ecological variables. It is thus not possible to segregate genetic differences using morphometric analysis, but only phenotypic differences. The reliance on morphometry, as espoused in the DOE reply (p. 56) is untenable, lest one confuses phenotype with genotype.

Currently, the best taxonomically valid phenotypic characteristics concern pelage. However, these need to be examined in light of subsequent information. Van Zyll de Jong's (1986) assertion that the different bison retain their phenotypic characteristics in captivity, except for body size, is categorically wrong. The most distinct differences between wood and plains bison from Elk Island National Park are the absence of "chaps" in wood bison, and the enlarged hair-mop and beard in plains bison. In captivity, however, wood bison from Elk Island National Park (EINP) do develop large chaps on the front legs and large hair mops and beards. That is, captive wood bison bulls look very much more like plains bison bulls. We have currently no explanation for these discrepancies, though observations in the Leipzig Zoo suggest that the long hair in the chaps of captive wood bison can be pulled out readily (letter 7. Sept. 1987 by W. Frey to S. N. Stuart, IUCN). However, we also know that the long display hair of plains bison bulls drops out before winter (Lott 1979). This matter still requires clarification.

The phenotypic differences between wood and plains bison that are likely to express genetic (taxonomic) differences are thus small and may be less than originally proposed by Geist and Karsten (1977), and subsequently refined by van Zyll de Jong (1986). While upholding two subspecies, I have much sympathy with the doubts expressed by Peden and Kraay (1979). The two bison subspecies in question are minimally distinct. This slight degree of divergence fits logically with the view that bison are very recent Siberian immigrants that came together with elk, moose, grizzly, timber wolf and man to fill the vacuum left by megafaunal extinction.

Hybridization of closely related subspecies is, in nature, a common event.

1. Dall's sheep (Ovis dalli dalli) met Stone's sheep (O. d. stoni) and left a mass of gray integrates of various colours, the "fannin sheep", across northern British Columbia and the Yukon Territory. Are we to conclude that all gray thin-horn sheep need to be eradicated?.

2. Mule deer of the subspecies hemionus hybridize extensively with black-tailed deer of the subspecies columbianus in British Columbia on the heights of the Costal Ranges (M. A. Cronin 1989, Yale Univ. pers. communication); hybridization between these two subspecies is old knowledge, as is hybridization between the subspecies sitkensis and columbianus in coastal British Columbia (Cowan 1936). Similarly, it appears that the subspecies injoensis may be a hybrid of hemionus and californicus (Wallmo 1981). Are we to eradicate mule deer in central British Columbia, Washington, Oregon and California because they have been hybridized to various degrees with black-tailed deer?

3. Or consider the mule deer: studies of mitochondrial DNA show that it is a hybrid of white-tailed deer mothers and black-tailed deer fathers, and that it arose from such a cross on several occasions (Cronin 1986; Carr et al. 1986; Stubblefield et al. 1986). Currently, the two ethological barriers that evolved to segregate breeding between white-tailed deer and mule deer are breaking down due to human action (Lingle 1989). Are we to conclude from this that mule deer, because they originated as hybrids, are worthless life forms that should be exterminated?

4. Hybridization of white-tailed deer subspecies is a totally unresolvable subject, because white-tailed deer recolonised alone, or with human help, this continent after their near demise at the turn of the century; it is impossible to determine what met and mixed or where various releases of white-tailed deer originated from.

5. The Columbian white-tailed deer (Odocoileus virginianus leuccurus appears to have done some hybridization with Columbian black-tailed deer (Gavin 1985). Does that warrant abandoning its protected status and conservation?

6. Note the "hybridization" of elk (Cervus canadensis): it is a late Siberian immigrant to North America, identical in external appearance and social signals to populations of elk in northern Mongolia. Today elk across North America are largely derived from reintroduced Yellowstone elk - plus an admixture of whatever local elk there might have been left over. This is due to vigourous reintroduction programmes in the early decades of this century, following the near demise of the species late in the 19th century (Robbins et al. 1982). Are our Rocky Mountain elk worthless hybrids?

In short, what we know historically of wood bison indicates that they were probably trivially different from plains bison due to the very short segregation from plains bison, the great likelihood of periodic contact between these subspecies, and the environmental effect generating different ecotypes. These bisons appear to be as much products of earlier meetings between northern and southern bison populations as were "fannin" sheep.

The salvaged "wood bison" (Nyarling River bison) from which the Mackenzie Bison Sanctuary originate, according to Berg (1989), from 6 males and 12 females; the herd in Elk Island National Park originated from 4 males and 17 females. The two herds of wood bison are thus based on a tiny sample of the gene pool of wood bison which, though affected by introduced plains bison, is still contained within Wood Buffalo National Park. The claim that 37 "wood bison" which formed the founding stock for the MBS and EINP herds, captured a "significant part" (p. 57 of Compendium of Govt. Submissions) of the genetic diversity of wood bison is completely unacceptable. It confounds absolute with effective population size, ignores founder effect and genetic drift, as well as the subsequent male dominance effect, and it ignores the very real probability that bison captured together are all related by maternal decent. Nor is DOE's claim substantiated by genetic analysis which finds little genetic variation in Nyarling River bison (see discussion in Bork's et al. unpublished ms.).

Moreover, the salvaged wood bison from the Nyarling River are probably also hybrids. Van Zyll de Jong (1986), but in particular Carbyn et al. (1989) in a preliminary report marshalled evidence that the Nyarling River bison were not isolated, but in contact with the southern populations of Wood Buffalo National Park's bison. Most telling is the fact that 24 of the 61 bisons captured on the Nyarling River carried bovine diseases. Also, when bison were much more numerous, as was the case in the 1940's, the Nyarling River bisons were not separated by 160-320 km of unsuitable habitat from other bison (Banfield and Novakowski 1960), rather, bisons were at the most 16 km apart. This, Carbyn et al. (1989) point out is revealed by examining Fuller's (1950) distribution map. Granted the propensity of bison to move rapidly and capriciously over long distances in response to predation, granted the presence of a well-used trail system between the Nyarling River and the Peace River, granted the presence of bovine diseases in the northern part of the park, then there is little doubt of contact between bisons throughout Wood Buffalo National Park.

Nor are the Nyarling River bison by any means homogeneous in their "wood bison" characteristics. Peter Karsten and I were called upon to select wood bison bulls in Elk Island National Park in a culling programme. The culled specimens were later used by van Zyll de Jong (1986) in his study. We thus examined in detail about 60 bulls before deciding on their fate. All specimens showed a mix of plains and wood bison features.

Furthermore, I did see a large sample of bison in the southern parts of Wood Buffalo Park during a visit in June 1980 spanning several days. The bison showed strong wood bison features, though some individuals were more like plains bison. This matches with the observations of Carbyn et al. (1989), who also report that Dr. Mary Maegher, long time student of plains bison, found the bison of Wood Buffalo Park to be different. It gives credence to an important idea of van Zyll de Jong (1986): he points out that the plains bison shipped to WBNP in the 1920's were primarily yearlings and two year olds. Consequently, the females in this cohort of plains bison would be primarily bred by the large, powerful wood bison males and not the small immature plains bison males. Since bison males do not mature socially till about six years of age, the large and numerous wood bison bulls would leave a large genetic effect on the hybrid herd.

Hybridization becomes genetic pollution and a biological tragedy only when it destroys a population's ability to survive under extreme conditions: i.e. severe predation, severe weather, narrow seasonal windows, or resource shortages. For instance, reintroduced Alpine Ibex (*Capra ibex*) mixed with either Nubian ibex (*Capra nubiana*, Turcek 1951) or domestic goats (*Capra hircus*) went extinct because the births of young were spread over much of the year, including winter, instead of being concentrated within a narrow, period in spring. The young born in winter died of exposure, and those born in summer failed to reach survivable size before winter and also died of exposure. Crosses of Siberian roe bucks and European roe deer females lead to birth complications due to larger then normal foetuses (Turcek 1951; Stubbe and Passarge 1979). European wild boar (*Sus scrofa*) appear to have various admixtures of domestic pig, recognizable by the presence of spotted individuals. Spotting is associated with decreased survival, lower oxygen binding capacity in the blood, decreased thermoregulatory ability and poorer development of the under wool (Briedermann 1986:94). Excessively large antlers, a common goal of so called "improvement" through hybridization of deer stock, were found to be detrimental to their bearers because stags with large, complex, unwieldy antlers were prone to be killed by smaller antlered stags in fighting; in the Rominten Heath, where red deer were managed for large trophy antlers, this was a painful concern since stags with outstanding antlers might be killed prematurely in fighting, instead of by dignitaries hunting there as guests (Frevert 1977). Hybridization of mule and white-tailed deer results in offspring that have neither parents anti-predator behaviour and are defenseless against predation (Lingle 1989).

The test of the effects of hybridization is survival under severe environmental condition. Using this criterion, then the "predator-pit" within which WBNP bison are currently found should eliminate whatever detriments hybridization did have. Pointing out, however, that the introduced "wood bison" are doing well in the MBS while the "hybrids" are not in WBNP and the SRL is a classic confusion of apples and oranges - as well as biased selection of evidence. Any expanding herd would be doing "well" compared to one in a predator pit. How well are the "wood bison" doing in other areas of release?

The proposition that Nyarling River bison are "pure wood bison" cannot be accepted with the facts at hand. Consequently, replacing the bison in Wood Buffalo National Park with "wood bison" from Elk Island Park would replace a hybrid herd containing the complete wood bison gene pool with a hybrid herd containing but a fraction of the wood bison gene pool. That is not an acceptable alternative.

Considering the above, even if genetic "fingerprinting" is done, what is one to choose? In how far are the "wood bisons (Nyarling River specimen)" representative if they are not only hybrids, but come from tiny founder populations which are affected by genetic drift and male dominance effects? Granted the inability to genetically type wood bison, how is one to go about selecting another 50-100 "valid" wood bison (see p. 57 of Compendium of Govt. submissions) to increase the genetic diversity of the founder herds?

To eradicate the current bisons in Wood Buffalo National Park would be to turn the 1925 CULTURAL tragedy into a truly BIOLOGICAL tragedy. It would destroy once and for all the northern bison gene pool. From an evolutionary and conservation perspective this gene pool is far more valuable than the limited and quite likely distorted gene pool of the Nyarling River bison salvaged today as the "wood bison" of Elk Island National Park or the Mackenzie Bison Sanctuary.

Taxonomically the WBNP bison should be considered as much Bison bison athabascae as the "fannin" sheep are considered Ovis dalli stoni, or British Columbia's mule deer remain Odocoileus hemionus hemionus, despite O. h. columbianus intrusion. The designation of WBNP bison as B. bison bison x athabascae as proposed by van Zyll de Jong (1986) can be dispensed with based on current information and practices. The WBNP herd remains the most valuable herd from the perspective of conservation - despite some human interference (hybridization, culling, changes in flooding of the Peace River etc.). It is the one and only bison population that has remained subject to the normal elements of natural selection: large predators, climate, landscape factors and forage resource availability. It is THE bison population to which our conservation effort should be directed, not towards preserving solely the genetically impoverished Nyarling River bison.

Is the conservation of a questionable wood bison PHENOTYPE with its limited and distorted gene pool being given priority over the conservation of the species GENOTYPE of Bison bison?

ESCAPES AND HYBRIDIZATION WITH DOMESTIC BISON.

Agriculture Canada supports the concept of "game ranching". Stocks of domestic plains bison are to be raised for slaughter as commercial enterprises close to Wood Buffalo National Park.

How does Agriculture Canada, having established "wood bison" in the park, expect these bison to remain genetically "pure" with ranched plains bison close by?

How does Agriculture Canada expect to keep ranched bisons behind fences - in perpetuity?

How does Agriculture Canada prevent roaming wood bison bulls in rut from crashing the game fences, attracted by domestic bison females?

How does Agriculture Canada rate current bison expansions and their encounters with fences at the northern border of Yellowstone National Park (Maegher 1989)?

Is the proponent unaware of magnitude and circumstances leading to escapes of stock from game ranches (Massey 1986; Rennie 1986)?

Is the proponent not aware of the herds of feral bison spreading in northern British Columbia, courtesy escapees from game farms?

Is the proponent not aware of the fact that these feral bison in B.C. are now heading towards the Liard river and the introduced "wood bison" found there?

Does the proponent really intend to saddle Canadian society with the conflicts arising from keeping wild and domestic stock of the same species close by (see Klein 1980; Geist 1988)?

It can be safely predicted that with bison ranches on the periphery of the park hybridization on a continual basis between escaped private plains bison and public wood bison is inevitable. With bison ranching a reality the proposed operation to establish a stock of "pure wood bison", even if feasible, would be futile and a complete waste of public funds.

DISEASES.

The fact that currently some(!) bison in Wood Buffalo National Park harbour bovine diseases has to be seen from the perspective of the biology of disease organisms, as well as that of the host. This has not been done by the proponent. Consequently, the argument that eradicating tuberculosis and brucellosis in Wood Bison National Park would "solve" any disease problem for agriculture must be considered as untenable. The circumstances surrounding diseases are much more complex than initially meets the eye. Here are some factors to be consider:

Livestock, by virtue of living in close proximity of one another, as well as due to protection from predation and the application of knowledgeable care to sick animals, have historically had much exposure to diseases. This should select for disease hardiness in livestock on one hand, and for increased virulence in the disease organism. We see these expectations confirmed in the notoriously severe effects of livestock diseases on wild ungulates, even on tropical species, the very life forms that ought to be most resistant to diseases (see Hibbler 1981; Kistner et al. 1982;)

Bisons, as old east-Siberians, are expected to be susceptible to the diseases of domestic relatives originating in milder climates of Eurasia. There is evidence that this group of large mammals, because of its long evolutionary history in the dry, cold climates of Siberia that are inhospitable to pathogens and parasites, is very vulnerable to the diseases of southern forms (Geist 1985). The best data supporting this hypothesis comes from the effects of the diseases of Eurasian immigrants on American Indians (Baruzzi et al. 1977; Black et al. 1979; Neel 1979; Lightman 1979; Joralemon 1982; Dobyns 1983). The susceptibility to diseases may have overshadowed the poorer competitive abilities of the "Siberians" wherever they have been released to compete against Eurasian species. American and Siberian wapiti, releases in Europe, readily became ill and fared poorly against red deer (Beninde 1937), as they did in New Zealand (Wodziki 1950). The few cases of North American moose brought into zoos or sanctuaries in Europe died inexplicably soon thereafter. Siberian roe deer, introduced repeatedly into Europe have also failed to thrive (Stubbe and Passarge 1979). White-tailed deer do poorly against fallow or sika deer (Davidson et al. 1983; 1985). Foayt (in press, J. Vet. Res.) placed six clinically healthy domestic sheep together with six bighorn sheep. The first of the bighorns was dead in four days, the sixths was dead in 71 days. The bighorns were victims of Pasteurella hemolytica, carried by 4 from the 6 domestic sheep. Similar experiments were conducted in Alberta on bighorns by infecting them with pathogens for which domestic sheep and cattle are carriers (Onderka et al. 1988; Onderka and Wishart 1988). These experiments confirmed earlier conclusions about the direction of disease transfer between bighorns and livestock, but based on circumstantial evidence (Goodson 1982). Both domestic sheep and cattle originate from wild forms adapted to lower latitudes and altitudes than the ancestors of bighorn sheep (Zeuner 1967). However, there are also views to the contrary: White (1987) states that bison are more, not less resistant to diseases than cattle.

Above experiments illustrate what is quite likely not a particular, but a general problem for North American large mammals of Siberian origin: weak immune systems due to a very long evolutionary history in the dry, cold climates of Pleistocene Siberia and Beringia (Geist 1985). That is, North American larger mammals of Siberian origin are not adapted at dealing effectively with the parasites and pathogens of relatives from southern latitudes. Consequently, Siberian mammals are likely to suffer from the diseases of native American relatives from southern origins, such as the effects of Odocoileus parasites on moose, wapiti and caribou (Anderson 1972; Anderson and Lankester 1974; Lankester 1987; Samuel 1979; Hibbler 1981), as well as from those of introduced Eurasian stock. A consequence of introducing white-tailed deer into Europe has been the introduction of the giant liver fluke into the local faunas (see Halls 1984:558). Today this parasite is a serious problem for livestock and roe deer.

Disease causing microorganisms are expected to be subject to natural selection and change in time. Under conditions of predation, we expect selection by wolves against VIRULENT forms of diseases and parasites (see Tessaro's limited, but illuminating observations on this point p. 4-20/21 of Bison Task Force Report; see also Broughton's et al. 1970 data showing the high frequency of brucellosis in domestic reindeer as opposed to a much lower frequency free roaming caribou in contact with wolves). Virulent strains should decline or go extinct as their hosts suffer an early death at the fangs of wolves and bears. Therefore, the higher the density of predators the poorer the chances for the survival of pathogens for two reasons: firstly, the lower the density of the carriers, the lower the chances of transmittal (well supported by the low incidence of brucellosis in odocoileid deer, moose and bears compared to gregarious elk, caribou and wolves; Witter and O'Meara 1970). Secondly, the better the bodily condition of the host due to more abundant resources per carrier, the greater the resistance of the host against diseases.

Let us look closer at the data given to this panel on diseased bison. Note: the data is confined to large samples of bison tested between 1947 and 1974; there has not been adequate testing since then. Between 1947-1974 WBNP bison were at the height of abundance - and wolf control was most intense (between 1951-1953 at least 183 wolves were killed (Carbyn et al. 1989). The bison tested, many of which were old animals, were thus infected from 5-15 years earlier, that is in the 1950's and 60's when bison were most numerous. Subsequently wolf controls were relaxed, the bison declined and are currently in a "predator pit". We are asked to believe that the conditions typical of a high density bison herd with minimal predation in the 1950's is identical to a declining low-density herd heavily decimated by predators in the late 1980's.

Does Agriculture Canada believe that the disease and ecological conditions of 30-40 years ago are the same as today?

Is it valid to base management in 1990 based on conditions that occurred 30-40 years ago?

What are the infection rates of WBNP bison with bovine diseases now, in 1990, after some 15 years of increasingly severe wolf predation?

What evidence is there that cattle get infected by the diseases now being carried by the bisons in Wood Bison National Park?

Have any domestic cattle been experimentally infected with the brucellosis strain 544, for instance?

What evidence is there that the predators, scavengers and commensals of bisons are severely infected with Brucella abortus? Since brucellosis is a very contagious disease (Witter and O'Meara 1970; Hibler 1981) it should be widespread in WBP and SRL wolves, coyotes, foxes, black bears, snowshoe hares and ravens. All of these come in direct contact with bison as predators or scavengers of carcasses, still births and afterbirths - let alone the soils roiled into dust by bisons in their wallows or the feces of bison. Predators and scavengers tend to carry the brucellosis type of their primary prey (Witter and O'Meara 1970; Neiland 1975; Tessaro and Forbes 1986). While wolves and a fox were found to be infected, no black bears were found with the disease (Tessaro 1986); grizzly bears were found infected in Alaska (Neiland 1975). In Europe hares are common carriers of brucellosis (Witter and O'Meara 1970).

Have varying hares been tested for brucellosis in WPNP?

Where are the hunters infected with brucellosis?

Estipona et al. (1989) not withstanding, it is Dr. J. K.

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Waters (pp. 92-94 Compendium of Govt. Submissions) testimony that no incidence of human infections with brucellosis in the vicinity of Wood Buffalo park is known! This is the more remarkable as domestic dogs, while showing few if any symptoms of brucellosis, readily become reservoirs of Brucella organisms, passing these out in their feces and urine (Witter and O'Meara 1970).

Since canids are quite susceptible to bovine tuberculosis, what is the incidence of wolves, coyotes and foxes with bovine TB in Wood Buffalo National Park?

The bovine diseases of bisons in Wood Buffalo National Park, now that predation is severe, are expected to decline in frequency, distribution and virulence. The chances of infection with these diseases by other organisms should diminish with predation pressure over time. Consequently, bisons under severe predation, carrying strains of pathogens their inferior immune system can tolerate, are not likely to be a great danger to domestic cattle - or anybody else.

With moose, wolves and a fox found to be infected with Brucella abortus, this diseases is not confined to the bisons of the park - as the public is being informed by the proponent in the news media. Nor is it reasonable to assume that the Park's bison will be isolated from potential disease carriers outside the park, where an outbreak of B. abortus biotype 2 occurred in 1986/87 near Vermilion. Forestry and agricultural developments insure a rather different ecological picture in the near future. With various wildlife species traversing the land (especially elk and coyotes as carriers of Brucella abortus) how can the dissemination of diseases be prevented?

With forestry denuding the landscape of climax forests and Agriculture Alberta turning northern Alberta via subsidised community pastures into cattle range, how can one prevent white-tailed deer, elk, moose and coyotes following in the wake of such changes from spreading livestock diseases to bison in the park or wildlife diseases to livestock outside the park?

While white-tailed deer have not been commonly encountered with Brucella abortus (Witter and O'Meara 1970; Witter 1981), moose, elk (Hibler 1981; Kistner et al. 1982; Tessaro 1986), wolves and coyotes have been (Neiland 1970; Davis et al. 1979).

How are reintroduced bison to the park ever to remain free of brucellosis and tuberculosis if agricultural areas outside the park are not free of these diseases?

Barren ground caribou (Rangifer tarandus groenlandicus), which are found in Wood Bison National Park, also carry brucellosis, but of the species B. suis biotype 4; it appears to be a consequence of introducing domestic reindeer to Alaska and Northern Canada (Meyer 1966; Neiland et al. 1968; Broughton et al. 1970; Neiland 1975; Tessaro and Forbes 1986).

This all raises questions: Since elk are carrying liver flukes via Banff National Park into the Bow Valley, and these liver flukes are dangerous to livestock, will Agriculture Canada apply to eradicate the elk in Banff National Park arguing that the elk are worthless hybrids between remnant Alberta elk and introduced Yellowstone elk?

The United Stated Department of Agriculture, despite its substantial resources, having begun an eradication campaign against brucellosis in domestic livestock in July 1934 has not succeeded some 50 years later; outbreaks continue to occur in the very states that follow the eradication programme rigidly. The same is true for tuberculosis (Kistner et al. 1981). Nor is Agriculture Canada denying that out-breaks of brucellosis and tuberculosis in cattle are everything but a thing of the past! In other words, Canada's cattle are relatively, but not absolutely free of brucellosis and bovine TB.

Granted such incomplete successes in eradicating brucellosis and tuberculosis in domestic cattle, what is the proponent's source of optimistic that he will control these diseases in wild bisons?

If the reintroduced bisons become diseased again (as is likely) will they be again decimated?

Will there be another $20 million dollars spent on another "hygienic" effort, and another, and another?

How many of such genetic "bottle-necks" through decimation does the proponent expect bison to survive?

Is the proponent aware that by destroying the last wild and genetically most significant bison herd in the world we stand in breach of the now much-lauded World Conservation Strategy to which Canada is a signatory?

Spending huge sums of public money on eradicating diseased

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bison in Wood Buffalo National Park would be futile if (a) the diseases are already in species other then bison, and if (b) all infected bisons are _not_ found and if (c) diseases are likely to be brought in from the outside. It would also be _unnecessary_ since with the severe predation pressure by wolves on bison and the declining bison population the disease organisms are expected to decline, ultimately into extinction. _Brucella abortus_ in Yellowstone National Park bison and elk is NOT faced by wolves!

If cattle are threatened by the diseases in question, and the export status of Alberta cattle producers is threatened, then the fault lies hardly with the park or the bisons.

Whose decision was it to bring cattle and domestic bison in the proximity of diseased bisons?

Whose decision is it to change landscapes and conditions so that diseases can be transported via wildlife between species across the park boundary?

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LITERATURE CITED

Anderson, R. C. 1972. The ecological relationships of meningeal worm and native cervids in North America. J. Widl. Dis. 8:304-310.

Anderson, R. C. and W, M. Lankester. 1974. Infectious and parasitic diseases and arthropod pests of moose in North America, Naturalist. Can. 101:25-50.

Banfield, A. W. F. and N. S. Novakowski. 1960. The survival of the wood bison (Bison bison athabascae Rhoads) in the Northwest Territories. Natl. Mus. Can. Nat. Hist. Pap. 8. 6 pp.

Baruzzi, R.C., Marcopito, L.F., Serra, M.L.C., Souza, F.A.A. and Stabile, C. 1977. The Kren-Akorore: a recent contacted indigenous tribe. In: P. Hugh-Jones (Editor) Health and Disease in Tribal Society. Ciba Foundation Symp. 49 (new series). Elsevier, Amsterdam. pp. 179-200.

Beninde, J. 1937. Zur Naturgeschichte des Rothirsches. Monographie der Säugetiere, Vol. 4, P. Schoeps, Leipzig. 223 pp.

Berg, R. 1989. Report to the northern diseased bison environmental review panel on bison genetics. In Compendium of Government submissions & technical specialist reports in response to the panel information requests document. Northern Diseased Bison Environmental Panel. Federal Env. Assess. Rev. Office. Ottawa, Ont. pp. 219-228

Black, F. L., F. De P. Pinnheiro, W. J. Hierholzer and R. V.

Lee. 1979. Epidemiology of infectious disease: the example of measles. In Ciba Foundation Symp. 49 (new series). Health and disease in tribal societies. Elsevier-New Holland, New York. pp. 115-130

Briedermann, L. 1986. Schwarzwild. Verlag Neumann-Neudamm, Melsungen. 539 pp.

Bork, A. M., C. M. Strobeck, F. C. Yeh, R. J. Hudson and R. K. Salmon (unpublished manuscript). Genetic relationship of wood and plains bison on Restriction Fragment length polymorphisms. Depts. Animal Science, Zoology and Forest Science, Univ. Alberta.

Broughton, E., L. P. E. Choquette, J. G. Cousineau and F. L. Miller. 1970. Brucellosis in reindeer (R. tarandus and the migratory barren-ground caribou, R. t. groenlandicus (L.), in Canada. Can. J. Zool. 48:1023-1027.

Carbyn, L. N., D. Huisman, E. Street and D. Anions. 1989. An analysis of the decline of bison in Wood Buffalo National Park from 1971 to 1981 and a review of the status to 1989. Draft manuscript. Canadian Wildlife Service, Edmonton.

Carr, S. M., S. W. Ballinger, J. N. Derr, L. H. Blankenship and J. W. Bickham. 1986. Mitochondrial DNA analysis of hybridization between sympatric white-tailed deer and mule deer in west Texas. Proc. Natl. Acad. Sci. USA 83:9576-9580.

Cowan, I. McTaggart. 1936. Distribution and variation in deer (Genus Odocoileus) of the Pacific coastal region of North

America. California Fish and Game 22:155-246.

Cronin, M. A. 1986. Genetic relationships between white-tailed deer, mule deer and other large mammals inferred from mitochondrial DNA analysis. M. Sc. Thesis, Montana State Univ., Bozeman, Montana.

Davidson, W. R. and C. B. Crow. 1983. Parasites, diseases and health status of sympatric populations of sika deer and white-tailed deer in Maryland and Virginia. J Wildlife Diseases 19(4):345-348.

Davidson, W. R., J. M. Crum, J. L. Blue, D. W. Sharp and J. H. Phillips. 1985. Parasites, diseases and health status of sympatric populations of fallow deer and white-tailed deer in Kentucky. J. Wildlife Diseases 21(2):153-159.

Davis, D. S., Booer, W. J., Mims, J. P., Heck, and L. G. Adams. 1979. Brucella abortus in coyotes. 1. A serologic and bacteriologic survey in eastern Texas. J. Wildl. Dis. 15(3):367-372.

Dobyns, H. F. 1983. Their numbers become thinned: Native American population dynamics in eastern North America. Univ. Tennessee Press. 378 pp.

Estipona, A., R. E. Mason Jr. and J. A. Young. 1989. Brucellosis - a range livestock problem. Rangelands 11(4):119-124.

Frevert, W. 1977. Rominten. P. Parey Verlag, Hamburg. 225 pp.

Fuller, W. A. 1950. Aerial census of northern bison in Wood Buffalo National Park and vicinity. J. Wildl. Manage.

14:455-451.

Fuller, W. A. 1966. The biology and management of bison of Wood Buffalo National Park. Wildl. Manage. Bull. Ser. 1(16), 52 pp.

Gavin, T. A. 1985. Pacific Northwest. Chapt. 27. In L. K. Halls (ed.) White-tailed deer. Stackpole books, Harrisburg, Pa. pp. 487-496

Geist, V. 1971. The relation of social evolution and dispersal in ungulates during the Pleistocene, with emphasis on the Old World deer and the genus Bison. Quaternary Research 1, 285-315.

Geist, V. 1978. Life strategies, human evolution, environmental design. Springer-Verlag, New York. 495 pp.

Geist, V. 1985. Game ranching: threat to wildlife conservation in North America. Wildl. Soc. Bull. 13:594-598.

Geist, V. 1988. How markets in wildlife meat and parts, and the sale of hunting privileges, jeopardize wildlife conservation. Conserv. Biol. 2(1):1-12.

Geist, V. 1989. Environmentally guided phenotype plasticity in mammals and some of its consequences to theoretical and applied biology. Chapt. 7. In Alternative styles of animals. Edited by N. M. Bruton, Kluwer Academic Publisher, Dordrecht, Netherlands. pp. 153-176

Geist, V. and Karsten, P. 1977. The wood bison (Bison bison athabascae Rhoads) in relation to hypotheses on the origin of the American bison (Bison bison Linnaeus). Zs.

160

Saugetierkunde 42:119-127.

Goodson, N. 1982. Effects of domestic sheep grazing on bighorn sheep populations: review. Bienn. Symp. N. Am. Wild Sheep and Goat Counc. 3:287-313.

Halls, L. K. 1984. (ed.), White-tailed deer ecology and management. Stackpole, Harrisburg, Pa. 870 pp.

Hewitt, C. G. 1921. The conservation of the wildlife of Canada. C. Scribner's Sons. New York. 344 pp.

Hibbler, C. P. 1981. Diseases. in O. Wallmo, ed. The mule and black-tailed deer of North America. Univ. Nebraska Press, Lincoln, pp. 129-155

Holmes, J. C. 1982. Impact of infectious disease agents on the population growth and geographical distribution of animals. in R. M. Anderson and R. M. May (eds.) Population biology of infectious diseases. Springer Verlag, New York. pp. 37-51.

Honess R. F. and K. Winter. 1956. Diseases of wildlife in Wyoming. Bulletin 9. Cheyenne: Wyoming Game and Fish Dept.

James, F. C. 1983. Environmental component of morphological differentiation in birds. Science 211, 184-186.

Joralemon, D. 1982. New World depopulation and the case of disease. J. Anthropological Res. 38(1):108-127.

Klein, D. R. 1980. Conflict between domestic reindeer and their wild counterparts: a review of Eurasian and North American experience. Arctic 33(4):739-756.

Kistner, T. P., K. R. Greer, D. E. Worley and O. S. Brunetti. 1981. Diseases and parasites (Chapt. 4), in J. W. Thomas and

D. E. Toweill (eds.) Elk of North America. Stackpole Books, Harrisburg Pa. pp.181-271

Lightman, S. 1979. The responsibility of intervention in isolated societies. In Ciba Foundation Symp. 49 (new series). Health and disease in tribal society. Elsevier-New Holland, New York. pp.304-314

Lankester, M. W. 1987. Pests, parasites and diseases of moose (*Alces alces*) in North America. Viltrevy Supplement 1(2): 461-489.

Lingle, S. 1989. Limb coordination and body configuration in the fast gaits of white-tailed deer, mule deer and their hybrids: adaptive significance and management implications. Masters Degree Project, Faculty of Environmental Design, Univ. Calgary. 289 pp.

Lott, D. F. 1979. Hair display loss in mature male American bison: a temperate zone adaptation. Zs. Tierpsychol. 49:71-76.

Maegher, M. 1989. Evaluation of boundary control for bison of Yellowstone National park. Wildl. Soc. Bull. 17:15-19.

Massey, W. 1986. Escape! The crisis faced by Robbie and Barbara Oldeman. The Deer Farmer. Sept.issue pp. 6-10.

McHugh, T. 1972. The time of the buffalo. E. A. Knopf, New York. 339 pp.

Meyer, M. E. 1966. The epizoology of brucellosis and its relationship to the identification of Brucella organisms. Am. J. Vet. Res. 25:553-557.

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Neel, J.V. 1979. Health and disease in unacculturated Amerindian populations. Ciba Foundation Symp. 49 (new series) pp. 155-167.

Neiland, K. A. 1975. Further observations on rangiferine brucellosis in Alaska carnivores. J. Wildl. Dis. 11:45-53.

Neiland, K. A., A. J. King, B. E. Huntley, and R. Skoog. 1968. The diseases and parasites of Alaskan wildlife populations. Part I. Some observations on brucellosis in caribou. Bull. Wildl. Dis. Assoc. 4:27-37.

Onderka, D. K., S. A. Rawluk and Wishart, W. D. 1988. Susceptibility of Rocky Mountain bighorn sheep and domestic sheep to pneumonia induced by bighorn and domestic livestock strains of *Pasteurella haemolytica*. Can. J. Vet. Res. 52:439-444.

Onderka, D. K. and Wishart, W. D. 1988. Experimental contact transmission of *pasteurella haemolytica* from clinically normal domestic sheep causing pneumonia in rocky Mountain bighorn sheep. J. Wildlife Diseases 24(4):663-667.

Peden, D. G. and Kraay, G. J. 1979. Comparison of blood characteristics in plains bison, wood bison and their hybrids. Can. J. Zool. 57:1778-1784.

Roe, F. G. 1970. The North American buffalo. (2nd ed.). Univ. Toronto Press, 991 pp.

Rennie, N. 1986. Good insurance deals are available, The Deer Farmer. Sep. issue pp. 11-12.

Robbins R. L., D. E. Redfern and C. P. Stone. 1982. Refuges and elk management. Chapt. 12, in J. W. Thomas and D. E. Toweill (eds.) Elk of North America. Stackpole Books. Harrisburg, Pa. pp. 479-507.

Samuel, W. M. 1987. Moving the zoo - or - the potential introduction of a dangerous parasite into Alberta with its translocated host. in L. A. Renecker (ed.). Focus on a new industry. Proc. Alberta Game Growers Assoc. Conf. 1:85-92.

Soper, D. 1941. History, range and home of the northern bison. Ecol. Monogr. 2:347-412.

Stubbe, C. and Passarge, H., 1979. Rehwild. Verlag Neumann-Neudamm, Berlin. 432 pp.

Stubblefield, S. S., R. J. Warren and B. R. Murphy. 1986. Hybridisation of free-ranging white-tailed and mule deer in Texas. J. Wildl. Manage. 50:688-690.

Tessaro, S. V. 1986. The existing and potential importance of brucellosis and tuberculosis in Canadian wildlife: a review. Can. Vet. J. 27:119-124.

Tessaro, S. V. and L. B. Forbes. 1986. Brucella suis biotype 4: a case of granulomatous nephritis in a barren ground caribou (Rangifer tarandus groenlandicus L.) with a review of the distribution of rangiferine brucellosis in Canada. J. Wildl. Dis. 22:479-483.

Turcek, F. J., 1951, Effect of introductions on two game populations in Czechoslovakia. J. Wild. Manage. 15:113-114.

van Zyll de Jong. 1986. A systematic study of recent bison with particular consideration of the wood bison. National Museum

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of Canada. Publications in Natural Sciences. No. 6, 69 pp.

Wallmo, O. C. 1981. Mule and black-tailed deer distribution and habitats. In O. C. Wallmo (ed.). Mule and black-tailed deer of North America. Univ. Nebraska Press, Lincoln. pp. 1-97

White, R. J. 1987. Big game ranching in the United States. Wild Sheep and Goat International, Melissa NM. 355 pp.

Wilson, M. C. and C. S. Churcher. 1984. The late Pleistocene Bighill Creek Formation and its Equivalent in Alberta: correlative potential and vertebrate palaeofauna. in W. C. Mahaney (ed.) Correlation of quaternary chronologies. Geo Books, Norwich. pp. 159-175.

Witter, J. F. and O'Meara. 1970. Brucellosis. in W. R. Davis, L. H. Karstad and D. O. Trainer (eds.) Infectious diseases of wild mammals. pp. 249-255. Ames, Iowa State Univ. Press.

Wodzicki, K. A. 1950. Introduced mammals in New Zealand. Dept. Sci.& Induct. Res. Bull. No. 98, Wellington, N.Z. 255 pp.

Ying, K. L. and Peden, D. G. 1977. Chromosomal homology of wood bison and Plains bison. Can. J. Zool. 55:1859-1862.

Zeuner, F. E. 1967. Geschichte der Haustiere. Translated from English by R. Ross-Rath, edited by J. Bosseneck and T. Halthenorth, Bayerischer Landwirtschaftsverlag, Munich. 448 pp.

Received
Edmonton
Jan 26 1990
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A TECHNICAL REVIEW
OF THE AGRICULTURE CANADA PROPOSAL
FOR DISEASE ERADICATION IN WOOD BUFFALO NATIONAL PARK

A Submission by
The Little Red River Cree Band,
High Level, Alberta

To
The Environmental Assessment Review Panel
On Northern Diseased Bison
Vancouver, British Columbia

January 1990

1.0 INTRODUCTION

Agriculture Canada has proposed a course of action to eradicate the diseases of bovine brucellosis (*Brucella abortus*) and tuberculosis (*Mycobacterium bovis*) from the bison in Wood Buffalo Park. At the request of the Federal Minister of Agriculture, the Federal Minister of the Environment appointed an Environmental Assessment Review Panel to conduct a public review of the environmental, resource conservation, socio-economic and health issues associated with the bison disease problem, and with alternative courses of action to deal with this problem (EARP 1989).

1.1 STATEMENT OF THE PROBLEM

During 1925-28, approximately 6,700 plains bison (*Bison bison bison*)were transplanted from Wainwright in east-central Alberta to the newly-created Wood Buffalo (National) Park. These plains bison had been infected with bovine brucellosis and tuberculosis from cattle, and carried these diseases northward to Wood Buffalo National Park during the transplant. The plains bison interbred freely with the existing population of approximately 1500 wood bison (*Bison bison athabascae*), as well as passing on both diseases to the wood bison. The herds of hybrid bison survived well, and by the late 1930's had attained a population of 10,000 - 12,000 bison. However, since that time, the population has gradually declined as a result of predation, accidental drowning, outbreaks of anthrax, and effects of brucellosis and tuberculosis on birth rates and calf survival (Supply and Services Canada 1989). Bison numbrs within and adjacent to Wood Buffalo National Park are now estimated at approximately 4400 animals.

Since the closure of the W.A.C. Bennett dam on the Peace River in 1968, altered water regimes in the Peace-Athabasca delta have resulted in changes in vegetation communities in Wood Buffalo National Park (Dirschl 1972; Cordes 1975). Local residents commonly believe that these changes in vegetation communities, particularly the drying out of wet meadow areas, have detrimentally affected the bison population through changes in food availability and range use (Eccles et al. 1986).

1.2 INTERESTS OF THE LITTLE RED RIVER TRIBE

The Little Red River Cree Tribe (to be referred to as the Tribe) has traditionally used the lands between Fort Vermillion and the west-central portion of Wood Buffalo National Park. Wildlife are of spiritual and cultural importance to the tribe members, and provide a source of meat and other products for subsistence use as well as direct income through fur harvesting. In particular, members of the Little Red River Tribe have utilized and continue to utilize bison as an important source of meat and hides. A herd of approximately 160 bison, known as the Wabasca Herd, ranges on provincial Crown Lands between the Little Red and Wabasca rivers, and is hunted annually by the Tribe. As the Wabasca Herd would be eradicated as part of the preferred proposal by Agriculture Canada, the proposed eradication of all disease-exposed bison in northern Alberta and the southwest Northwest Territories is of major concern to the Tribal Administration and the Tribe members.

The Little Red River Tribe does not believe that distinctions between the wood bison, plains bison and the hybrid bison in Wood Buffalo National Park are important. All of these animals are buffalo and are worthy of protection. The Tribe does support conservation initiatives to protect and manage wood bison, but such conservation must not be at the expense of other healthy animals. Designation of some animals as hybrids or crosses between Wood and Plains bison does not justify their slaughter.

The following technical review was prepared by the Little Red River Tribe to complement their earlier submission to the Review Panel (Little Red River Tribe 1990) which described the views of the Tribe on the eradication of bison and disease control in the area of Wood Buffalo National Park. From a traditional spiritual and socio-economic perspective, the Little Red River Tribe opposes the proposed plan of action by Agriculture Canada on the following basis:

1. The potential alternatives and the proposed plan of action to control the bison disease problem in Wood Buffalo National park has not addressed the traditional, cultural and environmental values of Indian people;

2. The process has not allowed Indian people any meaningful participation in the scoping, development and assessment of alternatives or the review process;

3. The process has not provided explicit recognition of Aboriginal People and Bands as stakeholders in the decision with a right to participate in a decision-making role;

4. Financial and independent technical resources have not been provided to Indian people to critically review the proposed plan of action and other alternatives;

5. The summary and technical documentation does not comply with the Federal Environmental Assessment Guidelines; and

6. The review has failed to identify and examine the severe socio-economic impacts on the Indian economy and the way of life that will rsult from implementation of this program.

The objectives of the technical review, in addition to supporting the Tribe's earlier submission are to critically review the proposal by Agriculture Canada and its background documentation, and to identify technical concerns that relate to the position of the Little Red River Tribe in their submission to the EARP Panel on Northern Diseased Bison (Little Red River Cree Tribe 1990).

2.0 PROCEDURAL CONCERNS

2.1 LACK OF A FORMAL ENVIRONMENTAL IMPACT ASSESSMENT DOCUMENT

Pursuant to the guidelines of the Federal Environmental Assessment Review Office (FEARO) for the Environmental Assessment Review Process (EARP), Agriculture Canada, as the project proponent must prepare an environmental impact assessment (EIA) which describes:

- the proposed project,
- the environmental and social resources that will be directly or indirectly affected by the project,
- the types of direct and indirect impacts to these resources that are likely to occur if the project is approved,
- the measures that will be taken to reduce or eliminate these impacts, and
- the residual impacts to environmental and social resources that will remain following mitigation.

To date, Agriculture Canada has not submitted a formal EIA document to the EARP Panel for public review.

A compendium of government submissions and technical specialists reports (FEARO 1989) has been made available to the Review Panel and the public. In addition, Agriculture Canada has prepared a submission to the Review Panel describing the project background, responses to information requirements by the Panel, and the proposed course of action, as well as several technical appendices on alternative proposals and disease transmission (Agriculture Canada 1989).

Although these documents contain a significant volume of information, the documents do not constitute a formal EIA document. An EIA should be a stand alone document that provides the decision-makers and the public with sufficient information to fairly assess and approve a project. It is not the responsibility or requirement of regulatory bodies or the public to assimilate information from a wide range of sources, and formulate an impact assessment from this material.

Furthermore, information is lacking in the these documents on the specific details of the proposed project (e.g., temporal, spatial and locational specifications of the plan of action), and the major environmental and social resources at risk in the project area (see below). In addition, impact predictions and assessments are scattered throughout several different documents, discussions of some impacts are lacking, incomplete or undocumented, mitigation measures are poorly described or lacking, and residual impacts are not discussed. Details on specific deficiencies are provided below.

The Little Red River Band does not accept the documents by Agriculture Canada (1989) and FEARO (1989) as sufficient as an EIA for the complex proposal to address the issue of Northern Diseased Bison.

2.2 SPECIFIC CONCERNS OR DEFICIENCIES IN THE AGRICULTURE CANADA SUBMISSION

During the review of the Agriculture Canada (1989) submission and supporting documents (FEARO 1989), a number of specific information deficiencies were identified, as well as a number of specific concerns in regards to the treatment and/or documentation of information, program alternatives and project impacts.

Deficiencies in the Agriculture Canada (1989) documentation include:

1. **Project Description**

   To fully evaluate the impacts of the proposed disease eradication program, information is required on specific facilities and activities including (1) locations of permanent and temporary facilities and access routes; (2) the construction and operational procedures for these facilities as they may affect environmental and social resources; (3) the schedule and specifications for human and vehicular activities associated with aerial surveillance, hazing and corralling of hybrid bison; (4) the schedule and activities for facility abandonment; and (5) reclamation procedures for disturbed and abandoned sites.

2. **Disease Distribution and Occurrence**

   Evaluation of the feasibility and impacts of the proposed eradication program requires a more comprehensive and recent assessment of (1) the distribution of bison herds and sub-groups within and adjacent to Wood Buffalo National Park; (2) the incidence of tuberculosis and brucellosis in these herds and sub-groups; and (3) the occurrence of the disease within these herds and sub-groups (e.g., by age and sex class). Information is also required on the phenotypic characteristics of animals within each herd or sub-group (e.g., hybrid animals vs. predominant wood bison or plains bison characteristics). For example, from the perspective of the Litle Red River Tribe, data on the Wabasca herd would assist in determining if special measures could be implemented to salvage animals from this relatively isolated herd.

3. **Definition of Assessment Terminology**

   Throughout the Agriculture Canada report, generalized, qualitative terms are used to evaluate the feasibility of various options and potential impacts. For example, the probability of success for prevention measures (Pg. 6) is described as "low", or "the potential for reinfection of bison with tuberculosis or brucellosis from other wildlife is extremely rare". If such generic terms are to be used, they must be defined. Preferably, quantitative risk assessment methodologies could be employed to quantify some of the project risks.

4. Assessment of Disturbance Effects

The discussion of potential disturbance effects to other wildlife (Pg. 18) is simplistic, and conclusions are unfounded. If assessments of the impacts of the slaughter/vaccination program for bison on other wildlife groups were not directly assessed, the lack of comment in Park literature and reports can hardly be used as evidence for the lack or insignificance of an impact. Comparison of the proposed activities to situations in Sweden and New Zealand are also not valid unless better documentation is provided (at minimum, a literature citation should be provided). In the case of these two studies, were effects on other wildlife actually assessed or is the statement that "no long term effects on non-target wildlife" a supposition?

5. Potential Impacts Not Considered

A number potential environmental and social impacts that may arise from the proposed eradication program were not discussed, including: (1) disturbance/harassment effects of human and vehicular activities on other wildlife groups, particularly moose, large predators and furbearers; (2) reductions in furbearers abundance due to increased wolf predation on free-ranging furbearers, as well as increased wolf predation on important prey (e.g., snowshoe hare) for some furbearers (e.g., lynx); (3) effects of hay harvesting on ground nesting birds, waterfowl and shorebird broods, small mammals and native plants; (4) effects of habitat change on plants and wildlife when hybrid bison are eradicated; (5) effects on wildlife of improved road access to Sweetgrass area; and (6) population effects of the loss of genetic diversity in the hybrid bison.

Trapper incomes may also be directly and indirectly affected by the proposed eradication program. Human and vehicular activity could disturb furbearers and alter the distribution of animals, thereby affecting trapping success (note: trapping occurs in Group Trapping Areas throughout most of Wood Buffalo national Park, as well as on Registered Trapline areas on Provincial Crown Lands adjacent to the Park). Reduced abundance of furbearers resulting from increased wolf predation on free-ranging furbearers or on the major prey of furbearers would also affect fur harvests. Wolves may also take trapped animals from traplines as an easy source of prey. Due to dependence of many older native people on income from trapping activities, such effects could seriously affect the economic stability of some native people.

A number of social impacts were also not addressed including (1) the economic effects of the bison eradication on native people (e.g., loss of source of meat and hides); and (2) potential loss of hunting rights for bison by native people in Alberta and British Columbia if wood bison (endangered and therefore not huntable) were to replace the hybrid/plains bison (presently huntable by native peoples on provincial Crown lands).

6. Mitigation and Monitoring

Although some mitigation measures are proposed for some impacts (e.g.,Pg. 40: Means to prevent the introduction of non-native plants), most discussions of impacts did not address potential mitigation methods and their effectiveness. For example, methods are not described for reclamation of disturbed sites and abandoned enclosure areas, or minimizing disturbance effects on other wildlife groups. Recommendations for long-term monitoring of moose populations (Mercier 1989) are commended, but similar recommendations are lacking for a number of areas where insufficient data is may be available (e.g., effects on hunting activities of native peoples).

7. Residual Impacts

Regardless of whether mitigation measures were proposed or not, residual impacts were not identified or evaluated.

A number of technical concerns regarding the proposed plan of action by Agriculture Canada are discussed in Section 3.2 (below).

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3.0 THE AGRICULTURE CANADA PROPOSAL: TECHNICAL CONCERNS

3.1 HISTORICAL BACKGROUND TO THE PROBLEM

A number of historical events, conservation initiatives and present political pressures have resulted in a concerted effort since 1986 to address bison management and disease control measures in Wood Buffalo National Park and its vicinity.

Prior to 1925, actions by the Government of Canada to create Wood Buffalo Park and reduce kills of woods bisons by fur traders, gold seekers and hunters through increased enforcement has resulted in the establishment of a growing population of approximately 1500 wood bison in the Peace-Athabasca region (Supply and Services Canada 1989). Transplanting of approximately 6,700 plains bison from Wainwright to Wood Buffalo Park in 1925-27 resulted in hybridization of the wood bison, as well as the introduction of bovine brucellosis and tuberculosis to bison in Wood Buffalo National Park, the Slave River lowlands and the Hook Lake region. The present problem of genetic contamination and disease transmission to remaining wood bison stocks is a direct result of earlier actions by the Government of Canada. It is therefore the responsibility of the Federal Government to assume full responsibility for these actions, and to undertake and fund appropriate programs to address the current problems in the context of the regional environmental and social constraints. From the perspective of the Little Red River Band, any such actions much be in agreement with principles for protection of native lifestyles and resource use as entrenched in Treaty 8.

Agricultural land base expansion in Alberta, particularly in the Fort Vermillion area, has greatly expanded the potential for contact between disease-exposed bison in the vicinity of Wood Buffalo National Park and domestic cattle and bison stock. As a result of the increased potential for disease transmission, agricultural interests have exerted pressure on the federal and provincial governments to address and solve the disease problem.

Rapid population increases in the wood bison population in the Mackenzie Wood Bison Sanctuary near Fort Providence, N.W.T., has resulted in expanded use of range areas outside the Sanctuary, and the potential for contact and disease transmission between wood bison in the N.W.T. and bison in Wood Buffalo National Park. In addition, the Department of Renewable Resources, Government of the Northwest Territories, has expressed an interest to re-establish a disease-free population of wood bison in the Slave River lowlands and the Hook Lake region. The Fish and Wildlife Division of the Government of Alberta, in cooperation with the Canadian Wildlife Service, has similarly expressed a desire to establish a disease-free population of wood bison in the Zama lakes region. As a result of the potential for genetic contamination and disease transmission from the bison in Wood Buffalo National Park, these government agencies are reluctant to proceed with these wood bison programs, and are in support of disease control programs in the vicinity of Wood Buffalo National Park.

Although the Little Red River Cree Tribe does support the need to address short and long term management of bison within Wood Buffalo National Park, and in particular, to control disease problems within the Park herds, the Tribe is opposed to a program to eradicate all bison within and adjacent to Wood Buffalo National Park. The Tribe believes that a more significant effort is required to investigate potential methods for disease control within the Park herds, as well as assess the potential range of factors that are presently resulting in the steady decline of bison numbers in the Park region. Although disease, predators and natural events may be partially responsible for the decline, we also believe there is a need to investigate the effects on bison habitat and demography of reduced water levels and habitat deterioration in the Peace-Athabasca delta associated with the closure and operation of the WAC Bennett dam

3.2 PROPOSED COURSE OF ACTION

The Agriculture Canada (1989) proposal for eradication of northern diseased bison assessed five possible alternatives:

- establishment and maintenance of a buffer zone,
- fencing of Wood Buffalo national Park,
- a combination of a buffer zone and selective fencing,
- maintenance of the status quo, and
- eradication of the diseased bison with replacement of wood bison.

Based on a review of these alternatives by Agriculture Canada, the first four alternatives were rejected. It is the opinion of Agriculture Canada that the only realistic long-term solution to the threat of genetic contamination and disease transmission is the eradication of all bison in the region of Wood Buffalo National Park and subsequent replacement with wood bison stock from the Mackenzie Bison Sanctuary and Elk Island National Park.

Based on a review of the Agriculture Canada (1989) submission and the compendium of government submissions (FEARO 1989), the Little Red River Band has identified a number of specific concerns:

1. **Distribution and Severity of Disease**

   Very little current information appears to be available on the occurrence of bovine brucellosis and tuberculosis in specific herds or groups of bison within or adjacent to Wood Buffalo National Park. Although data cited in the Agriculture Canada submission states that rates of infection for the two diseases were between 30-39% during the 1950s-1960s, and approximately 43% in 1987 (based on a sample of 56 hunter-killed animals)(Pg. 41)(Tessaro 1987), the submission frequently cites the disease occurrence as 50% or half of the existing herd. Is there additional and more recent information available to substantiate this higher estimate? Unless more substantive data on disease occurrence is available, there is clearly a need to better document the rates of infection and distribution of infection throughout the various herds and subgroups of bison throughout Wood Buffalo National Park, and in the Hook Lake, Slave lowlands, Wabasca and Firebag River areas.

2. Risk of Disease Transmission Through Other Vectors

Information is presented to indicate that other wildlife species (moose, wolf and fox) can act as secondary carriers of brucellosis (Pg. 42). Can other wildlife species serve as vectors for tuberculosis? Is there a potential for moose, wolves and foxes, as well as disease transmission among these and other wildlife species, to act as reservoirs of brucellosis, particularly during the period after eradication of the hybrid bison and the introduction of the disease-free wood bison?

Agriculture Canada dismisses the potential for moose-bison transmission of brucellosis as moose "rarely mingle with bison" (Pg. 42). However, winter and summer ranges of moose and bison overlap in a number of areas throughout the Peace-Athabasca delta (Eccles et al. 1986), and there may be potential for transmission of disease through mucous, droppings or other biological factors.

What are the characteristics of brucellosis infection in moose (e.g., visible and physiological symptoms, effects on survival and reproduction, degree of contagion)? Is there potential for moose to act as short-term carriers of the disease? Under some circumstances, will control of moose populations be necessary for disease containment during the eradication program?

3. Potential Domestic/Semi-domestic Reservoirs of Disease Organisms

In Section C.4.6 (Pg. 43), a number of domestic species and semi-domesticated species are identified as effective vectors of brucellosis infections. Are there similar effective transmitters for tuberculosis? What are the risks for latent infections of brucellosis or tuberculosis in these species? Will any special control measures for these animals be necessary to prevent?

Reference is made repeatedly throughout the Agriculture Canada submission that unless tuberculosis and brucellosis are eliminated in Wood Buffalo National Park, the Federal Government will have to continue annual detection and surveillance testing at considerable cost (Pg. 7). Will not many of the surveillance programs in

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abattoirs and livestock markets need to be continued, perhaps on a less intensive scale than present testing, to ensure that latent infections from domestic or wild sources do not occur?

4. Feasibility of Successfully Eradicating Diseased Bison

A major assumption for successful eradication of brucellosis and tuberculosis is that all diseased and disease-exposed bison within and adjacent to Wood Buffalo National park can be eliminated over a period of 6-8 years. Three eradication programs in other countries are cited (Pg. 41) to support Agriculture Canada's contention that complete eradication is possible. The three examples are not analogous to the situation in Wood Buffalo National Park. The Australian cattle example may include large surface areas, but the range is likely quite flat and open (e.g., minimal tree cover), therefore the target species (cattle) would be highly visible (note: the citation for this study is provided to corroborate the results). The example of feral cattle on Molokai is also not appropriate as an island has well defined limits that would greatly assist in effective searching and elimination. The last example of feral water buffalo is also of limited applicability, as the area involved (380 km^2) is considerably smaller than the area proposed for the Northern Diseased Bison program (70,000 km^2).

Based on input from native trappers from within and adjacent to Wood Buffalo National Park, it appears that bison occur in a number of small isolated pockets, as well as in large herds. For example, the Dene Tha have suggested that 3-4 small isolated herds of bison exist in the vicinity of Zama Lake.

As complete (100%) eradication is essential to the success of the $21 million program, has a risk assessment be performed to determine the probability of success/failure? What is the potential for reinfection of the re-introduced wood bison from other wildlife species and other latent sources?

What are the criteria for testing the introduced wood bison? If animals within the re-introduced herd tested positive for tuberculosis or brucellosis, will the entire new herd be eradicated? The Agriculture Canada proposal should address the contingency for such an occurrence, particularly in regard to the fate of the herd, their logistical and financial ability to successfully introduce another group of disease-free animals to the Park, and the potential financial and scheduling repercussions for a second re-introduction.

The methods for round-up, corralling and transportation of hybrid bison are described in general terms. To what extent will ground hunting of animals be used to eliminate hybrid animals? Will aerial hunting of isolated animals be used as part of the eradication program?

3. Wolf Predation of Moose

Although moose only occur in low densities throughout the Peace-Athabasca delta, Messier (1989) concedes that wolves may switch to moose as alternate prey as the hybrid bison are eradicated. If monitoring programs of moose (as suggested by Messier) indicate that wolves are killing unacceptably high levels of moose, or are reducing local traditional hunting success, what measures will be taken to correct or adjust the situation? Are wolf control measures to be a possible component of the eradication program?

4. Introduction of Non-Native Plant Species

As discussed (Pg. 40) by Agriculture Canada, use of native hay is preferable in order to avoid potential introduction of weeds to the Park. If the eradication program were to proceed, use of native groundcover species (propagated from local sources) should be required in any revegetation program within or directly adjacent to the Park.

5. Occupation of "Ideal" Range by Hybrid Bison (Pg. 58)

As mentioned earlier in this brief, the Little Red River Band believes that Agriculture Canada, in conjunction with Environment Canada, should (1) undertake an assessment of habitat succession and deterioration in the Peace-Athabasca delta as a result of the WAC Bennett dam, and (2) determine if these changes have affected the carrying capacity of Wood Buffalo National Park for bison.

6. Potential Agricultural Land

Summary Statement 11 on Page 61 suggests that "unproductive diseased bison would occupy a very large area .... of potential agricultural land. How has pressure to open and develop agricultural land in the vicinity of the Park influenced the direction of the disease eradication program?

The Province of Alberta recently completed an assessment of agricultural land base expansion throughout the province. As some lands with high agricultural potential have been identified in the area between Fort Vermillion and the western boundary of the Park, what is the position of the Government of Canada and the Government of Alberta on agricultural land base expansion in this region?

It is the position of the Little Red River Band that the Green (forested) Zone in the Fort Vermillion area should be maintained, and that agricultural expansion should be discouraged. Will the Governments of Alberta and Canada be willing to protect and maintain forested lands, and to enter into a comanagement agreement with native people for management of forest and wildlife resources in this region?

7. Questioning of Intervenor Motives

On page 61 of the Agriculture Canada submission it states "One has to question the motives of anyone supporting any of these options.... Are proponents of these options actually supporting options they know will fail?". This presumptuous and inflammatory statement is an unprofessional and thinly-veiled threat towards any individual or organization not in agreement with Agriculture Canada's proposal. The remark is uncalled for, inappropriate in the project proposal documentation, and should be struck from future documentation to the Panel and the public. A retraction of this remark and apology should be required from Agriculture Canada.

3.2 SUGGESTED ALTERNATIVES

The Little Red River Tribe recognizes the complexity and difficulty of eradicating brucellosis and tuberculosis from the bison population in the Wood Buffalo Park region. Although the basic biological assumptions of the preferred alternative (i.e., eradication of hybrid animals and replacement with wood bison) are sound, the success for such a program is questionable due to:

- the extremely large area over which bison will have to be eliminated,

- the tendency for some animals, particularly mature bulls, to utilize areas well removed from the major herds. Single animals or small groups of 2-3 animals may occur in many such locations.

- the use by single animals or small groups of small openings in densely forested sites (e.g., openings in white spruce forests along the Peace River)(Eccles et al. 1986), thereby confounding the problem of locating and eradicating all animals, and

- the potential for transmission and retention of the disease in other wildlife species.

Due to the large area and the potential difficulty in locating animals, the Little Red River Tribe believes that the estimate of $21,000,000 for a 10-year program is conservative, if not unrealistic.

Due to the traditional and spiritual ties of our people with the land and wildlife, we are opposed to the wholesale slaughter of all bison in northern Alberta and Wood Buffalo National Park (Little Red River Tribe 1990). Accordingly we cannot support Agriculture Canada's proposal for eradication of the hybrid animals and subsequent replacement with wood bison. Instead, we propose that:

1. All reasonable attempts should be made to manage the existing disease problem within the Park through a program of culling of diseased animals and management/isolation of the remaining animals (see Environment Canada 1989). Animals with predominant wood bison characteristics should be preserved as they are likely to represent an important reservoir of genetic diversity. In light of the fact that all of the existing wood bison in the Mackenzie and Elk Island populations were founded from a population of only 37 animals, preservation of such diversity if viewed as essential by the Little Red River Tribe;

2. Studies should be initiated to determine the severity and distribution of brucellosis and tuberculosis within the Park bison;

3. Studies of habitat quality/deterioration in the Peace-Athabasca delta should be conducted. If habitat deterioration has occurred as a result of the WAC Bennett dam, measures should be implemented to restore habitat conditions within the delta area, and to manage the bison herd within the context of this habitat management program;

4. Initiate a research program to isolate and develop an effective vaccine for bison against brucellosis and tuberculosis as an alternative to the eradication program. Such an approach to disease control is compatible with the spiritual and cultural values of the Little Red River Cree. Should such a program be initiated, the Tribe would provide support and assistance to the program.

5. If methods can be developed to control tuberculosis and brucellosis in healthy free-ranging bison in Wood Buffalo National Park, undertake rearing and releases of disease-free wood bison in Wood Buffalo National Park and the surrounding area to restore a predominance of this sub-species, while also incorporating and maintaining the genetic diversity of those hybrid animals with predominant wood bison characteristics.

6. Design, implement and manage any control program in close cooperation with native people; and

7. Establish and develop a comanagement strategy for bison populations in the vicinity of Wood Buffalo National Park, involving appropriate

federal, provincial and territorial government agencies, and representatives of local native groups. The comanagement agreement must recognize and entrench the traditional rights of native people to manage and utilize the renewable resources of this region, as well as maintain forested lands and wildlife habitat.

4.0 RECOMMENDATIONS OF THE LITTLE RED RIVER BAND

1. That a two-year moratorium be declared on any decision on the bison herds and the eradication program, pending completion of further environmental studies of direct relevance to this study, including comprehensive and up-to-date surveys of the wood bison population (abundance, seasonal distribution and movements, herd and sub-group relationships, phenotypic characteristics), habitat (conditions, distribution, use by bison), predator-prey relationships in relation to the disease problem, and interactions among habitat condition, predators, climatic conditions, disease, and bison demography.

2 Agriculture Canada should undertake extensive studies in the summer of 1990 to determine as accurately as possible the nature and extent of the tuberculosis and brucellosis in bison in and adjacent to Wood Buffalo National Park. Such studies should determine the extent and rate of infection in specific herds and subgroups of bison such as the Wabasca herd. All studies should be conducted in conjunction with adjacent aboriginal communities.

3. Agriculture Canada should prepare a comprehensive statement on the current state and short-term future or research on treatment and cure of tuberculosis and brucellosis in bison for submission to the Review Panel and the public.

4. Agriculture Canada must prepare a proper and comprehensive EIA/SEIA in close consultation and coordination with the affected Aboriginal communities. This EIA should be based on the premise that Aboriginal people have an important stake in the future of bison in the Wood Buffalo national Park area. Accordingly, the EIA must be designed, conducted and written in close consultation, and with the support of aboriginal communities surrounding the Park.

5. In order to complete an adequate and comprehensive EIA/SEA,and to allow or adequate community consultation and public review, the Review panel should delay any decision on the eradication program until 1 October 1990.

6. Intervenor funding should be provided by Agriculture Canada top Aboriginal organizations to conduct an independent review of the draft and final EIA/SEA.

7. Agriculture Canada should undertake the design and plan of a bison herd management program, in consultation with regional Aboriginal people, which specifies the role, benefits, undertakings, and financial commitments to Aboriginal communities, in the event that any disease control program is implemented.

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8. Agriculture Canada should undertake a comprehensive Aboriginal compensation program, designed in consultation with regional Aboriginal people, which outlines the policy, criteria and procedures by which compensation will be granted to Aboriginal hunters and trappers.

9. In conjunction with any decision on disease control and bison management, Agriculture Canada should be required to enter into long-term written agreements and contracts with various Aboriginal communities and organizations surrounding the Park, specifying in writing the benefits (e.g., employment, compensation) to be allocated to each of the communities or organizations if their proposal proceeds.

10. Planning processes must be designed and implemented in consultation with Aboriginal organizations and communities to ensure the conservation of forested (Green) zone areas adjoining the Park. Such planning agreements should entrench the rights of Aboriginal people to participate in the decision-making process for land and wildlife management.

5.0 LITERATURE CITED

Agriculture Canada. 1989. Agriculture Canada's submission to the Northern Diseased Bison Assessment Panel. 17 November 1989. 96 pp.

Cordes, L.D. 1975. Vegetation changes in the Peace-Athabasca delta: 1970-74. Prep. for Dep. Indian and Northern Affairs, Nat. Hist. Parks Branch, Ottawa.

Dirschl, H.J. 1972. Evaluation of ecological effects of recent low water levels in the Peace-Athabasca delta. Can. Wildl. Service Occ. Paper. Ser. No. 13.

EARP. 1989. Terms of Reference. Environmental Assessment Review Panel. Northern Diseased Bison. January 1989. 6 pp.

Eccles, R., J.E. Green, C. Thompson and G.F. Searing. 1986. Slave River Hydro Project. Mammal Studies. Volume I: Final report. Prep. for the Slave River Hydro Project Study Group by LGL Limited, Calgary, Alberta. 368 pp.

FEARO. 1989. Northern Diseased Bison Environmental Assessment Panel. Compendium of government submissions and technical reports in response to the Panel information requirements document. Federal Environmental Assessment Review panel, Vancouver, B.C. 295 pp.

Little Red River Tribe. 1990. Submission to E.A.R.P. Panel on Northern Diseased Bison Environmental Assessment. Little red River Cree Tribe. Presented in Fort Vermillion, Alberta. 16 January 1990. 5 pp.

Messier, F. 1989. Effects of bison population changes on wold-prey dynamics in and around Wood Buffalo National Park. Prep. for Federal Environmental Assessment Review Office and the Northern Diseased Bison Environmental Assessment Panel. 29 pp.

Supply and Services Canada 1989. Dealing with the Diseases of bison in northern Canada. Newsletter No. 1. January 1989. Supply and Services Canada. 8 pp.

Tessaro, S.V. 1987. A descriptive and epizootiologic study of brucellosis and tuberculosis in bison in northern Canada. Ph.D. Thesis, University of Saskatoon. 320 pp. Cited in Agriculture Canada 1989.

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Received
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Jan 26 1990

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January 25, 1990

Colin Lachance
Northern Diseased Bison
Environmental Assessment Panel
Vancouver, B.C.

Dear Sir;

The Alberta Cow Calf Association supports the removal of diseased bison from Northern Alberta and the repopulation of Wood Buffalo National Park with disease free bison. We do however, have the following concerns.

1. The legitimate concerns of the native people have to be addressed.
2. We question the logistical practicality of insuring the remove of all diseased bison.
3. Before depopulation and repopulation is undertaken, we recommend that a program be devised that will insure the protection of the restocked bison from cattle born diseases. Cattle born diseases such as IBR, BVD, and BRSV, will be, potentially, as devistating to the bison as brucellosis and tuberculosis.

Respectfully submitted,

Priestley-Wright

FW. Priestley-Wright, President
Alberta Cow Calf Association

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Received
Edmonton
Jan 26 1990

WOOD BUFFALO NATIONAL PARK
Brucellosis & Tuberculosis Problem

Submitted to: Northern Diseased Bison Environmental Assessment Panel
Submitted by: Lacombe Fish and Game Association, January 26/1990

On behalf of the Lacombe Fish & Game Association, we would like to present our views and concerns of the parks disease problems. In our view, solutions fall into four basic categories:

1) Do not interfere with the area, let nature take its course. The cattle industry says if the disease were to escape its present boundaries, the damage would be irreparable. Unfortunately, ignoring a problem seldom makes it disappear.

2) Enclose the park with "buffalo proof" fence. This solution would keep the diseased animals from coming in contact with alternate carriers or domestic livestock. The problem with this idea is that a perfect enclosure would be extremely hard to maintain, some infected animals may escape The cost of such an undertaking would be exorbitant.

3) Treatment of all the disease carriers in the park, if a treatment exists. Facilities for such a program would have to be assessed. If a complete inoculation of the diseases is possible, the general public would likely find this idea the most appealing. Arguments against this idea would include the fact that some infected animals may escape untreated. Some would argue that the cost of a roundup would be impractical, favoring the next alternative, eradication of the herd.

4) Eradicate the entire Buffalo herd. Complete eradication would be an immense undertaking. The possibility of recontamination exists if even a single pair of buffalo go unseen. If 100% successful it would end the chance of buffalo transmitting the diseases, but what about other carriers in the park? Would these threats to a disease free area meet the same fate? Killing and leaving dead animals throughout the park would be totally unsatisfactory, therefore a mass round up would be necessary. The buffalo could then be taken to a processing plant to be utilized. Capturing the buffalo, however, brings us back to option 3. Why not treat and release the healthier animals rather than kill them all?

cont.

The most practical way of eradication the herd would be to first significantly reduce their numbers through a controlled hunting program. A favorable method of accomplishing this is through a draw system. The money raised by such an effort could be used for later restocking programs, or to complete the extermination. To fully guarantee success, the armed forces could be considered to conduct an aerial gunning of very remote areas. The economic value of a sport hunt to area residents would go a long way in soliciting their support.

Regardless of the panels final decisions we would like the following points to be assured:

1a) A substantial herd of Buffalo be absolutely assured for the park, by whatever means necessary.
2a) Harassment of other wildlife be kept to a minimum. Special consideration must be given to the nesting Whooping cranes.

In conclusion, we feel this serious problem should be dealt with soon. The following represents an ideal outcome for our members.

A) We would like to see as much of the herd be saved as possible. All treatable animals should be saved to assure a large healthy herd for the future.
B) If a complete eradication is eminent, then a controlled sport hunt should be introduced, prior to its completion.

On behalf of the Lacombe Fish and Game Association we would like to thank the panel for their attention to our views. We trust a suitable solution can be found for this problem to satisfy all those concerned.

Yours Truly,

R Selvais

Ron Selvais
Vice President
Lacombe Fish and Game
Association

G Creasey

Grant R. Creasey
Chairman Hunting Committee
Lacombe Fish and Game
Association

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Fort Chipewyan, Alberta
January 26, 1990

Northern Diseased Bison
Assesment Panel

To Whom It May Concern:

Just dropping you a few lines regarding the proposed program to eliminate the diseased hybrid Buffalo in Wood Buffalo National Park. If this Program is to proceed, we would like to see that these requirements are met with the People:

1. We understand that: If this program is to proceed, that at one stage the bison will be all killed off and restocked. What we would like to see is that the wolf packs which kill off these buffalo for their food 12 months a year also would be all killed off before the Wood Bison Program proceeds. Because if the wolf packs are not eliminated, when all the buffalo are killed off, the wolf packs will kill all our moose and many other small animals. Also, the trappers will be affected very badly. When the trappers go to set traps on these traplines, the wolves will come along and scavenge everything that is caught in their traps; which will mean a big loss to the trappers.

2. We all understand that the totalcost of the whole project will cost $20,000,000. Supposedly, if the job is only half finished and the $20,000,000. has already been spent, could Agriculture Canada give us some type of guarantee that the project will be completed at all cost.

3. Another thing we would like to see carried out is a field test on the bison before the project proceeds to see actually how many of these animals are infected with tuberculosis or brucellosis. If there is a field test to be carried out, it would be good to see it carried out over the whole park instead of just in one area. Also, in different age ranges from one year old to 20 years old bison. Also, if this is to be carried out, we would like to see the Hunters and Trappers of W.B.N.P. hired to do the job. If the whole project is to be carried out, again, we would like to see the Hunters and Trappers from this area get the first job opportunities and also any other contracts, instead of some Helicopted Company coming in and taking the work away from the Hunters and Trappers. If in any tough spot where man can't do it, then we understand that a Helicopted Group is necessary,then so be it.

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4. Apparently, in the 1920s when these Buffalo were first brought in from Elk Island Park, there was some type of agreement made with the People and Parks Canada: that if the people would agree to extend the Park boundaries from the Peace River as far south as the 27th Base Line for more grazing land, when the Buffalo herd increased to a certain amount, each family would get one buffalo per year. This agreement was never kept by Parks Canada to the People.

5. If the wole project is to proceed: when all the bison are killed off, and before the restocking starts, why doesn't Agriculture Canada build a fence along the Banks of the North side of the Peace River and release the South Bank all the way to the 27th Base Line back to the Province of Alberta? Because I think that the Hunters and Trappers, and also the people of Fort Chipewyan would benefit more from the Resources and mineral in the delta and Bearch Mountains than they will ever benefit from the Buffalo. The reason for asking for this is I think if there is only one buffalo left in W.B.N.P. or there is 200,000 buffalo in W.B.N.P., the people from this area will never ever have any access to these buffalo in Wood Buffalo National Park.

6. Since someone brought up the subject of the Bennett Dam in the Public Hearings which were held in Fort Chipewyan on the 24th of January 1990, over the diseased Bison problem: this Bennett Dam which was built in British Columbia in 1968 and has caused very low waters in the Peace Athabasca Delta. Since that Dam was built, it really caused the muskrat population in this area to extremely decline. So, in the near future, we would like to see something done about this problem, to restore the water in the Peace Athabasca Delta.

Yours Truly,

Peace Athabasca

Delta Trappers Association

President

Reggie McKay

Reggy Mckay

Submission to the Northern Diseased Bison Environmental Assessment Panel from The Wood Bison Project, February, 1990

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WOOD BUFFALO NATIONAL PARK 1990

The Wood Bison and the Whooping Crane

The year of 1990 should be a time of change for the area of Wood Buffalo National Park and the surrounding area. Originally designated as a park in 1922, it was set apart from development to provide a place of safe refuge for the last remaining herd of wood bison (Bison bison athabascae). Unknown to the men who delineated the area of the Park, it also enclosed the last nesting place of the whooping crane (Grus americana). Thus, the Park not only saved the wood bison from extinction at the hands of native hunters armed with guns, it also saved the Whooping Crane from extinction at the hands of these same hunters and from egg and specimen collectors who were out to get the last remains of the rapidly disappearing race of these great birds.

So it has transpired that the fate of the two most valuable of North America's most endangered species has been bound up together in the Wood Buffalo National Park. While both species are now recovering in numbers; the wood bison population has far exceeded that of the whooping cranes. While the wood bison was nearly lost through absorption by the 6,673 plains bison introduced in the years 1925-28, they have made a most remarkable recovery from plantings made outside the park. It is now safe to say that when the present diseased population of hybrid bison is removed, the wood bison will have recovered from the danger of extinction.

There is no question as to whether the hybrid bison should be destroyed. These animals are acting as a reservoir of infection for three serious diseases that affect both animals and man: tuberculosis, brucellosis, and anthrax. It is claimed that Wood Buffalo National Park contains the largest free-roaming herd of bison in the world, and that these animals are a world heritage. The stark fact is that this herd is the largest herd of scrub, mixed-breed, heavily-diseased bison in the world! They are a detriment to Canada and the World! **The true fact** is that Canada does have the largest herd of healthy, free-roaming wood bison in the world - they are located in the Mackenzie Bison Sanctuary, not in Wood Buffalo National Park !!! The only other herd of free-roaming bison of comparable size is the plains bison herd in Yellowstone Park in the U.S.A. - and that herd is infected with brucellosis !!

As a world-wide movement to clean up the environment is getting underway, the diseased herd in Wood Buffalo National Park should be on a first priority basis for removal. The medical profession now claims that smallpox has been eliminated worldwide. These other diseases that have been a scourge to mankind will also be slated for elimination from the face of the earth. Canada is making good progress in this regard. The cattle herds of the country are now declared to be free of brucellosis - the disease known in man as undulant fever. Also, Canada's cattle herds are now virtually free of tuberculosis - a disease that is being rapidly removed from the human population as well. **The health concerns of the nation cannot tolerate any further containment of these diseases !!!**

The question remains: **Should the Wood Buffalo National Park be repopulated with healthy wood bison ?** The park has now fulfilled it's obligation of preserving the wood bison. As the park area represented 6% of the original wood bison range, it would appear that the area is not required for the further increase and expansion of the wood bison herds. Former historical and prehistorical ranges include northern British Columbia, the Yukon Territory, Alberta, Northwest Territories, Alaska, and Saskatchewan.

Plantings of wood bison can be made in all of these areas, and a valuable resource again established in the Boreal forest areas of North America. Progress has already been made with these plantings, with one in the Nisling River location in the Yukon Territory, one at Nahanni in the Northwest Territories, and recently, one at Muncho Lake in northern British Columbia. Not only should plantings be made on this continent, but also in it's prehistoric ranges in northern Asia and Europe.

It has been claimed that plains bison moved north into the Boreal forest zone after the melt of the Wisconsin ice sheet and that they then changed into a larger, darker animal, and became the present wood bison. This would be quite impossible !! The time since the recession of the ice is calculated to be between 10,000 and 20,000 years. No animal could change that drastically in such a short span of geological time !

Although the wood bison and the plains bison are very similar animals in appearance - and some frames of genetic fingerprinting do not show any differences between the two races - that does not tell the whole story ! There are several wide differences in the anatomy of these two races of bison that preclude any possibility of the wood bison being another variant of the plains bison. The larger size, darker color, larger tail, concave back profile, high hump, tall narrow build, larger horn core, and different conformations of hair on forehead and on legs, are together sufficient evidence to place the wood bison in a position as being a separate species in their own right.

Although the wood bison is so closely related to the plains bison that the two animals can hybridize with fertile offspring, so also can the European bison (Bison bonasus) hybridize with the plains bison (Bison bison bison) and produce fertile offspring. This was done in Germany to increase the vitality and production of calves in the European bison. Yet the European bison is classified as a separate species of bison, while the wood bison is only rated as a subspecies of the plains bison !!!

Coupled with these outstanding features is the evidence of the prehistoric range in the north. The area of the former wood bison habitat in North America has now been traced from the Bering Strait, right across central Alaska, central Yukon, and down to the present historical range in Northwest Territories, Alberta, British Columbia, and Saskatchewan. It is very evident that the wood bison came to North America during the last ice age (the Wisconsin) when the land corridor of Beringia provided a bridge from Asia, and when an ice-free refuge remained in Alaska and the Yukon Territory.

A parallel can be drawn between the wood bison and plains bison and the races of mountain sheep. Evidently the Stone sheep and the Dall sheep (Ovis dalli) came to North America from Asia at the same time as the wood bison. These sheep still occupy Alaska, Yukon, and northern British Columbia. They had evidently lived in the ice-free area of Alaska and Yukon during the glacial age and the stone sheep had moved south in the mountains following the melting of the glacial ice. They were stopped by the barrier of the Peace River valley and never contacted the Bighorn sheep which had worked north and were also stopped in their northward expansion by the Peace River.

The wood bison also expanded their range to the south following the melting of the glacial ice, crossing the Peace River to reach their recent historic range south of the Peace River. At the same time the plains bison expanded their range to the north following the ice melt, briefly contacting the range of the wood bison. There are areas along the Athabasca River where no remains of either race of bison have been found. It is thus evident that the plains bison and the bighorn sheep came to North America from Asia **before** the last ice age (the Wisconsin) and that the wood bison and Dall-Stone sheep came from Asia **during** that ice age !

That the wood bison is completely adapted to life in the boreal forest zone has been amply demonstrated. The bison herd in the Mackenzie Bison Sanctuary has grown from the original 16 animals in 1963 to the present 2,000-3,000 head. And this under the most severe conditions, with no protection from wolf predation and with some hunting allowed. At the same time, the plains bison-wood bison hybrids in the Wood Buffalo National Park have been steadily declining in numbers ! It is clear that the wood bison is the animal to use in populating the northern bison ranges!!!

One very important factor of bison management has been omitted from the environmental study of the Northern Diseased Bison Environmental Assessment Panel. That is the presence of the very serious disease of Anthrax in the Wood Buffalo National Park and the Slave River Lowlands. On page 62 of **Status Report on Endangered Wildlife in Canada 1987 - Wood Bison** it is stated: " Infection with anthrax has not been reported in the Slave River Lowlands or Wood Buffalo National Park since 1978 and, therefore, does not appear to be a major factor in population dynamics of bison at the present time. However, because the area is contaminated with anthrax spores, the threat of an outbreak remains a hazard to free-roaming bison." (Coupland,1975) All of the infected area must be placed under quarantine, with no bison or domestic cattle ranged there. **This would preclude any new introduction of healthy wood bison**, as it would only be staging the potential for new epidemics of anthrax in the following generations of bison in Wood Buffalo National Park.

New populations of healthy wood bison proposed by Agriculture Canada for re-introduction into Wood Buffalo National Park and the Slave River Lowlands could be used to better advantage if they were placed on new clean ground in various parts of the original wood bison ranges. The area to be depopulated of the diseased bison is **not** critical to bison survival and would serve no useful purpose other than to provide a food supply for native resident peoples. The threat of anthrax epidemics outweighs that consideration. Bison meat is only a minor part of the food supply and can more safely be replaced from other sources.

There still remains the obligation of the Wood Buffalo National Park to the whooping crane. The situation with regards to the these birds is very different from that of the wood bison. While new plantings of the bison can be made in any chosen habitat, that procedure cannot be followed with the cranes.

Whooping cranes are now only nesting in the areas adjacent to the where they were hatched. Attempts to create new breeding flocks have failed. In Idaho, the whoopers raised from eggs given to the greater sandhill cranes have not established a breeding flock. It thus appears that any further expansion and increase of nesting whooping cranes must come from the cranes themselves - from the breeding flock that is established in Wood Buffalo National Park. Increase of the whooping crane there has been slow, but steady during the years of full protection. The number of cranes in this wild nesting area is now at about 140 birds - a 10-fold increase from the all-time low ! With the present rate of increase of about 20 chicks yearly, it is now hoped that a much higher rate of population increase will soon take place.

As a nesting pair of whooping cranes establishes a territory of about 5 km^2 it is evident that all of the present nesting areas will soon be occupied. New, young nesting pairs will be required to move farther afield and pioneer new nesting sites beyond the ancestral grounds. Hopefully then, we will have a gradual expansion of the whooping crane into other suitable habitat to the north and south, and a final number of dispersed cranes that will put them out of danger of extinction.

The whooping cranes now require the whole area of the Wood Buffalo National Park. It would be desirable to extend the area of the park to the east, in order to take in former breeding areas that will be needed by the expanding flocks. Whoopers nested at Fort Resolution and near Salt River in 1864 (Lockhart - per Allen) This would take in the Slave River Lowlands. The part of the Slave River Lowlands and areas to the east that are in the Northwest Territories could be incorporated into the present Wood Buffalo National Park and be called Whooping Crane National Park. As the expanded areas to the south would be under provincial jurisdiction, it would remain a decision of the Alberta Government as to whether any of the Province's lands east of the Slave River should be incorporated in the new park.

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To give the cranes every opportunity to increase under full protection, no major changes should be made in the environment: no dams, no power transmission lines, no mining activities, and no other human enterprises such as heavy tourist traffic. As well, **to introduce new herds of bison into the nesting areas should not be considered**. The trampling herds of bison, plus their attendant bands of wolves, could only be a menace to the nesting whooping cranes. The diseased hybrid herd and wolves are even now a menace ! Although avian tuberculosis is supposed to be different from bovine tuberculosis, it is not definitely known whether the cranes could contract any of the three diseases: anthrax, brucellosis, and tuberculosis.

Along with the removal of the diseased bison herd, there should also be a large scale reduction in the number of predators in the Wood Buffalo National Park area. This would mean the elimination of the wolves that are now preying on the hybrid bison herds. With the bison gone, the wolves would turn to any other prey available, and the nesting cranes would suffer. Black bear and coyotes should also be removed.

Because of the small nesting and wintering areas of the whooping crane, it would only take one natural or man-made catastrophe to wipe out the entire flock. The well-being and increase of the whooping crane must take precedence over any other rights - whether they be the right-of-life of wolves, the right of native peoples to hunt, or the right of the human population to exploit the resources. Wolves, bear, and coyotes are **not** in any danger of extinction at this present time - **the whooping crane is !!!**

It is a matter of comparative values. While the wood bison is a valuable animal in a material way, their well-being no longer requires living room in the Wood Buffalo National Park. **The whooping crane does require this living space!!!** The value of these great white cranes lies not in any material sense, but in the aesthetic. Like great painting, sculpture, or other work of art, a beautiful flower, or a waterfall, their value lies in the imponderable assets of unique loveliness that enrich what, otherwise, could be a dull and humdrum existence. **North America, and the world, would be a poorer place to live in if the whooping crane were to disappear from the scene !!**

Along with a fully protected nesting area enclosing Wood Buffalo National Park, an expanding crane population will require a larger wintering ground. The present range at the Aransas National Wildlife Refuge in Texas will need to be enlarged. Hopefully the cranes will again extend into their former winter habitat in Louisiana, and farther beyond on the Gulf coast.

As the United States and Canada have been co-operating in a joint effort for the recovery of the whooping crane, it will be desirable that both countries enlarge their protected areas. New areas adjacent to the Aransas Refuge should be set aside for the cranes, and their wintering grounds given full protection from oil spills, poachers and commercial developments that would interfere with their habitat. As for Canada's part, an enlarged Whooping Crane National Park, with **full** protection given to the nesting birds, is well within the realm of possibility !

We repeat some of our former proposals for management of the Wood Bison National Park, and wood bison in particular:

1. Depopulate all the hybrid bison herd south of Great Slave Lake.
2. Make the Mackenzie Bison Sanctuary a fully-protected area - a place of refuge for the wood bison and replacing Wood Buffalo National Park.
3. Change the name of Wood Buffalo National Park to **Whooping Crane National Park** and enlarge the park to include the Slave River Lowlands.
4. Channel all the resources of the park towards the preservation and increase of the whooping crane.
5. **Do not** repopulate the Wood Buffalo National Park, the Slave River Lowlands, or any of the surrounding areas with wood bison.
6. Remove wolves, coyotes, and black bear from the Park and from the future adjoining nesting grounds of the whooping crane.
7. **Do not** allow any man-made development in the Park or nesting grounds of the whooping crane.
8. Place all of the area infected with anthrax under full quarantine, with no bison - either ranched or free-roaming - and no domestic cattle allowed entrance or range there.
9. Depopulation of the diseased bison must only be done during the winter months, when the whooping cranes are absent from the Wood Buffalo National Park.

Barbara Collier
Box 249
Bon Accord, Alberta
TOA OKO
921-3956

February 12, 1990

TO: THE NORTHERN DISEASED BISON ENVIRONMENTAL
ASSESSMENT PANEL

FROM: Barbara Collier

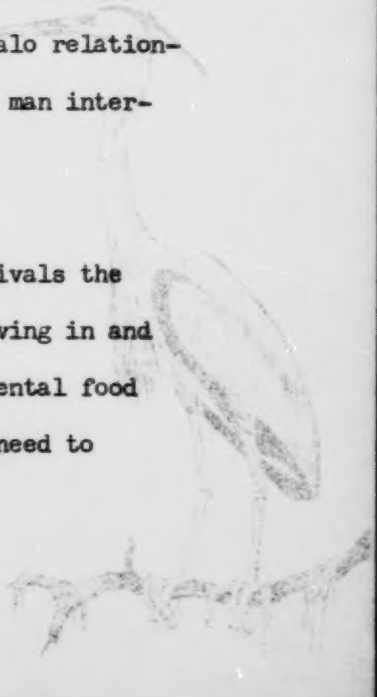
FEB 15 1990

FEARO PACIFIC

As reiterated many times, the whole problem with diseased buffalo in Wood Buffalo National Park began with a calculated mistake 65 years ago. In 1925, 6,000 plains bison were transported to Wood Buffalo and released. Not only did this act bring brucellosis and tuberculosis to the Park but it created a new bison, neither plains nor wood. Now we seem to be on the verge of making Mistake No. 2!

This is a complex problem involving many special-interest groups--natives, environmentalists, cattlemen, the Alberta and federal governments. Of course, the group forgotten in all this is the animals: the buffalo, the wolves and all the other predators and scavengers who rely on the wolf/buffalo relationship. A solution will not be easy. It does seem, however, when man interferes and tries to manage wildlife, he always messes up!

The intertwined heritage of the buffalo and native populations rivals the relationship of the buffalo and the wolf. Native populations living in and around the Park have hunted the buffalo for decades as a supplemental food source, never suffering ill effects from the meat. They see no need to destroy this life force.



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Environmentalists stand on both sides of the issue--some opposing the slaughter of so many living things and seeking other solutions, some feeling they must be slaughtered to protect the pure wood bison herd to the northwest.

Cattlemen, of course, feel the buffalo must be destroyed to preserve their brucellosis-free status in the international cattle market. Cattle grazing leases within 100 km. of the Park are being utilized presently and bison wonder up to 300 km. outside the Park boundaries. There is a vaccination for brucellosis but it only works in about 65% of the cattle innoculated. Presently all cattle coming into stockyards for resale or slaughter are tested for brucellosis and tuberculosis. Internationally, Canada has been considered brucellosis-free since 1985.

Government involvement occurs because of pressure from special interest groups. The cattlemen pressure both levels of government to protect their brucellosis-free status and increase their grazing ranges for cattle; the natives fight for the aboriginal right to have buffalo to hunt; environmentalists work at preventing destruction of species and food chains; the general public looks on with confused or jaundized eyes not sure which path to follow.

A number of thoughts and questions come to my mind, as a lay person viewing this compound problem.

Various people state this disease can be passed to humans but the natives don't seem to contract it. Is there some reason for their seeming immunity? Have any scientific studies been done to prove this disease can be passed to people?

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If the buffalo are eliminated from Wood Buffalo the Alberta government and special interest groups may lobby to have the Park down-sized to provide more grazing range for cattlemen and to allow oil and gas exploration and development.

The grass is not nutritionally adequate for cattle in this area. An expensive supplemental feed program will have to be carried out by ranchers, probably with government subsidy.

The ecological balance and food chain will be upset if the wolf's optimal prey animal is eliminated. Perhaps other large ungulates could take the bison's place in the scheme of things but then what happens to populations of these ungulates? What happens to the wolf population and all the other scavengers and predators who depend on wolf kills for sustenance--fox, wolverines, ravens, eagles, coyotes?

It is extravagantly expensive and impossible to round up and kill 4,200 buffalo in a 45,000 square km. park. If one diseased animal is missed reinfection of introduced healthy animals is inevitable. The moose that roam the Park are also diseased. Will they not reinfect any healthy buffalo brought into the Park? Will they not infect cattle being grazed within their range? Will wolves not infect the healthy buffalo? Are we going to slaughter all these animals to safeguard the cattle industry and the bison in the Mackenzie Sanctuary?

The genetic diversity of the 4,200 member Wood Buffalo herd is much greater than the 2,000 unit Mackenzie Bison Sanctuary herd which originated from a

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genetic base of 18 animals. Elimination of the Wood Buffalo animals puts the whole wood bison population in genetic jeopardy.

Is it known whether historically buffalo have undergone periods where they have been infected with brucellosis and tuberculosis? The disease can remain dormant for seven years. Does the disease routinely run its course through a herd over a number of years and eventually die out? Is the herd naturally and periodically reinfected from an outside source such as moose or wolves? Has anyone tested the purebred wood bison in the Mackenzie Sanctuary to ascertain if they are diseased?

SOLUTIONS:

1. The buffalo herd in Wood Buffalo National Park should not be destroyed. I believe that the results of the diseases plus wolf predation will eventually eliminate brucellosis and tuberculosis. We can retain the genetic diversity of this herd, keep the predator populations healthy and allow the natives to continue their way of life.

2. The cattlemen have a genuine problem keeping their brucellosis-free status credibility in the world cattle market. The answer must be to disallow free-range grazing within 300 km. of the Park. Where are these cattle from drought-stricken Southern Alberta to go then? A good solution to this problem could benefit both southern ranchers and northern farmers. Peace River area farmers have had a number of crop failure years, are in financial distress and have had to seek government assistance. Government incentives could be directed to encouraging northern farmers to fence their property and rent it as pastureland to southern ranchers. The ranchers would have nutritionally adequate

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pastureland out of the range of the infected buffalo and the farmers would have a steady income which they could supplement with the usual grain-farming operations.

3. The current practice of testing and innoculating cattle should be retained at the auctionmart, slaughterhouse and international sale ring levels.

4. Research (using some of the $22 Million earmarked to eliminate the buffalo) should be carried out on an accelerated basis to determine whether the buffalo have always carried these diseases and whether they are re-infected from other resident animals, both ungulate and predator.

Until results from this research are ascertained, the buffalo in Wood Bison National Park should be left alone. Cattlemen should move their cattle to pastures outside the roaming range of the bison.

Barbara Collier

Barbara C. Collier

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HOLSTEIN ASSOCIATION OF CANADA

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1990 February 09

Submission to the Environmental Assessment Review Panel concerning Wood Buffalo National Park

Dear Sirs:

This is our second submission.

The fact that the Hearings were held in Northern Alberta and the Northwest Territories has made it difficult for some interested parties to appear. Moreover, the fact that we were only offered ten minutes to present our point of view made travel to Edmonton seem pointless, provided that you studied the written submissions carefully.

We are greatly disturbed by the reports in the media that the views presented to the Panel were in many cases based on a major misunderstanding of Agriculture Canada's proposal.

The herd in Wood Buffalo National Park will never prosper as long as it is infected with Brucellosis and Tuberculosis. Herd depopulation is thoroughly proven as a means, the most economic means, of eradicating Brucellosis. The bison herd in the park is not pure Wood Buffalo, but it could be replaced by the pure strain.

Accepting the Agriculture Canada proposal, as expensive and as difficult as it is, is the most practical way for Canada to protect the future of the Wood Bison, allow it to prosper in an environment which is friendly to it, and to bring the accompaning benefits to the peoples of the area, as well as the other wildlife species depending upon it.

We in the cattle industry are extremely concerned about the spread of Brucellosis to the cattle population, particularly at a time when the movement of animals around Canada is not traceable. The potential loss of our industry has been quantified for you, and is enormous.

Zoo keepers around the world cooperate in ensuring that the population of endangered species is protected, and that over crowding does not result in suffering or damage to the representatives in any given zoo. Birth control and selective culling are practiced for the protection of the species: the proposal for the Wood Buffalo is not different except in scale.

We firmly believe that if the details and merits of the Agriculture Canada proposal were properly understood by all interested parties, very few would oppose it. Speaking for the members of this Association, who represent one half of the dairy industry in Canada, I urge you to support the Agriculture Canada proposal, and to instruct that a proper program of explanation and education be undertaken in support of it.

David H. Clemons
Chief Executive

DHC:km

RECEIVED

FEB 16 1990

[illegible]

ALBERTA SHORTHORN ASSOCIATION
#219, 16421-Stony Plain Road
EDMONTON, ALBERTA T5P 4E8
(403) 489-6904

February 12, 1990

RECEIVED
FEB 19 1990
FEARO PACIFIC

Mr. Colin Lachance,
Executive Secretary,
Northern Diseased Bison,
Environmental Assessment Panel,
510 - 750 Cambie Street,
VANCOUVER, B.C.
V6B 2P2

Dear Mr. Lachance:

The Alberta Shorthorn Association welcomes the opportunity at this time to express its concern and management ideas concerning the diseased bison herd in Wood Buffalo Park. As all cattle producers in Canada we are very concerned in how this situation is handled.

As seed stock producers this is a very urgent matter. In Canada we have been declared "Brucellosis Free". Without quick action by the participating government agencies, we will be undermining the credibility of our eradication program in this country.

Without the help of our Government departments and education programs, it would have been impossible to cleanup our domestic herds. We believe that the same effort is required by the government and all concerned parties to eliminate this problem.

As seed stock producers, the Alberta Shorthorn Association passed a resolution at their Annual Meeting in January 1990, supporting the Canadian Cattlemen's Association in their proposal of depopulation of the diseased herd of Wood Buffalo National Park and the repopulation of a pure disease free Wood Buffalo Herd in the park.

Being people that work with animals on a daily basis, we do understand many of the concerns of the natives and other interest groups. But being realists, we all must face the facts. These diseases not only threaten domestic cattle in our country, but are also a threat to the general public.

We feel the solution as proposed by Canadian Cattlemens Assocation is the most feasible. The prolonging of the situation in Wood Buffalo National Park only increases the chance of exposure to domestic cattle. This is a situation that cannot be prolonged any further. Any re-infection of our domestic herds will erode our credibility as good producers of clean cattle to the world.

cont....

"The eyes of the world are upon us". In this statement we are saying that many of our foreign buyers are aware of the existence of the diseased bison in Wood Buffalo National Park.

If we show leadership in this country in the elimination of these diseases in our bison herds as we have done in our domestic herds we will be applauded for our foresight.

In closing the Alberta Shorthorn Association endorses fully the stand taken by the Canadian Cattlemens Association.

The Alberta Shorthorn Association finds it very unfair and unrealistic that we have legislation requiring the immediate depopulation of domestic cattle that are infected or suspected of being infected with Brucellosis.

The Canadian cattle industry has worked hard in the last thirty years to eliminate these diseases and yet the Government continues to maintain a large herd of diseased bison at great public expense.

We thank you for your consideration on this matter.

Yours truly,

Fern Teske

Fern Teske (Secretary)
ALBERTA SHORTHORN ASSOC.

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Agriculture
Canada

Food Production
and Inspection Branch

Direction générale,
Production et inspection des aliments

Health of Animals Laboratory
116 Veterinary Road
Saskatoon, Saskatchewan
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Your file Votre référence

Our file Notre référence

February 20, 1990

RECEIVED
FEB 23 1990
FEARO PACIFIC

Mr. Colin Lachance
Executive Secretary
Northern Diseased Bison
Environmental Assessment Panel
510 -- 750 Cambie Street
Vancouver, B.C. V6B 2P2

Dear Mr. Lachance:

At the public hearings in Fort Smith, Mr. Bob Connelly indicated that Agriculture Canada should respond in writing to comments on brucellosis made by Mr. Bob Ruttan on behalf of Ms. Cathy Day who was not present at that time. Since these comments were presented orally, not in writing, I have referred to my own notes and found six points in Mr. Ruttan's presentation which he attributed to Ms. Day. I have enclosed my responses to these points.

Sincerely yours,

Stacy V. Tessaro

Stacy V. Tessaro, MSc, DVM, PhD.

cc/ Dr. W.S. Bulmer
    Dr. W.D.G. Yates

enclosure

RESPONSES REQUESTED BY MR. ROBERT CONNELLY (CHAIRMAN, NORTHERN DISEASED BISON ENVIRONMENTAL ASSESSMENT PANEL) TO POINTS MADE BY MR. BOB RUTTAN ON BEHALF OF MS. CATHY MAY AT PUBLIC HEARINGS IN FORT SMITH, N.W.T., ON JANUARY 22-23, 1990.

1. **Vaccination is effective in eradicating brucellosis in cattle, therefore it should be similarly effective in bison.**

Response:

Strain 19, a modified live Brucella vaccine, is the only widely acceptable vaccine used to control bovine brucellosis in cattle. Although it is currently the best vaccine available, it does not provide absolute protection from the disease and will not ensure elimination of brucellosis from infected cattle herds (Nelson 1977). The vaccine is not approved for males of any age or for females less than 4 months, or more than 8 months, of age. A current summary of strain 19 vaccination:

"Under both natural and experimental conditions, vaccination of cattle with Brucella abortus strain 19 enhances immunity to pathogenic field strains. This immunity is described as relative immunity, which is the ability to prevent infection after exposure to small to moderate numbers of organisms, but inability to prevent infection when there has been exposure to large numbers of highly virulent organisms. When vaccinated cattle are exposed to pathogenic field strains before immunity has developed to a protective level, brucellosis may develop in these cattle after vaccination. In addition, brucellosis may develop in cattle thought to be immune, provided the exposure is great enough to overcome the immunity level in the cattle involved. Therefore, in spite of strain 19 vaccination, exposure to pathogenic B. abortus may result in development of brucellosis in cattle previously free of the disease." (Crawford et al 1988).

Strain 19 affects bison and cattle differently. A recent field trial demonstrated that vaccination of bison calves with strain 19 did not impart any reasonable protection from infection and abortion when these animals were subsequently challenged with a virulent strain of B. abortus (Davis et al 1989). Field trials of low-dose strain 19 in adult bison indicated that strain 19 is pathogenic in adult female bison, causing a high rate of abortion, repeated abortions in some individuals, and natural transmission of strain 19 from vaccinated to non-vaccinated herdmates (Davis et al 1988).

2. **Serological tests for brucellosis are inaccurate and frequently give false-positive results (i.e. positive test results in animals that are not infected).**

Response:

In Canada, the buffered plate antigen test (BPAT), Brewer's Card Test (BCT), and standard tube agglutination test (STAT) are used as screening tests for bovine brucellosis, and the direct complement fixation test (CFT) is used as the confirmatory test.

The statement by Ms. Day refers to false-positive results, which Clarke (1977) referred to as "test overkill". This is quantified as the difference between ideal test specificity (100%) and the actual (measured) specificity of the test. The specificity of the tests for brucellosis that are used in Canada have been evaluated, under Canadian conditions, using numerous serum samples from cattle in brucellosis-free, non-vaccinated herds:

TEST	SAMPLE SIZE	SPECIFICITY	FALSE POSITIVES	SOURCE
BPAT	600	98.3%	1.7%	Forbes 1983
	1051	98.9%	1.1%	Stemshorn et al 1985
	1128	98.8%	1.2%	Dohoo et al 1986
BCT	600	99.7%	0.3%	Forbes 1983
	1051	100.0%	0.0%	Stemshorn et al 1985
STAT	600	100.0%	0.0%	Forbes 1983
	1051	99.2%	0.8%	Stemshorn et al 1985
	1128	99.5%	0.5%	Dohoo et al 1986
CFT	600	100.0%	0.0%	Forbes 1983
	1051	100.0%	0.0%	Stemshorn et al 1985
	1128	100.0%	0.0%	Dohoo et al 1986

Similarly, McCaughey and Carlisle (1970) evaluated sera from 1105 brucellosis-free, non-vaccinated cattle living in isolation on Rathlin Island, Ireland. Their results indicated that the specificity of the CFT was 100% (no false-positive reactions) and of the STAT was virtually 100% (a few titers of $\leq$ 23.5 I.U. were found but these would be below the threshold for interpretation of a positive test).

In summary, the serological tests used to detect brucellosis in Canadian cattle have very high specificity, and therefore the number of false-positive reactions is very low. By using a battery of tests, the small number of false-positive reactors is further reduced. As good as these tests are, serology results alone rarely determine the fate of a herd: the individual animals that react on a repeated series of tests are usually examined bacteriologically to confirm the presence of B. abortus before a decision is made to depopulate the herd. In the case of bison in and around Wood Buffalo National Park, bacteriology has confirmed the presence of B. abortus biovars 1 and 2 in this population (Tessaro 1987).

When considering serological test methods, false-negative reactions (i.e. negative reactions in animals that are infected) pose a much greater danger for disease eradication programs than do false-positive reactions.

3. Immune animals respond to the test.

Response:

Immunity to bovine brucellosis is a relative term. The presence of antibodies to B. abortus in the blood (the basis of the serological tests) does not indicate that an animal is "immune" (Nelson 1977). Humoral immunity (i.e. antibody production) is not protective against brucellosis, in part because the bacteria occur inside cells where antibodies cannot reach them. Research and experience in diagnostic laboratories indicate that the higher the antibody titer, especially on CFT, the greater the likelihood of recovering B. abortus from cattle (Lambert et al 1960, Hernitz and Searson 1986, Huber and Nicoletti 1986) and the broader the range of infected tissues (Forbes pers. comm.). Antibody titers do not indicate the course of the disease or the outcome of the disease. Cell mediated immunity appears to play a greater role in ameliorating the effects of brucellosis; this cannot be reliably measured in cattle. The relative immunity provided by strain 19 vaccine does not correlate with serological test results and, regardless of antibody titer, protection can be over-whelmed by exposure to a large dose of virulent B. abortus.

4. Bison that were immune to brucellosis would be the best animals to have in and around Wood Buffalo National Park.

Response:

This has been explained in (3) above. Immunity to brucellosis is, at best, relative (Nelson 1977). Animals may carry the bacterium for variable periods, often for many years

(Lambert et al 1960). After 60 years of infection, bison in and around Wood Buffalo National Park exhibit clinical effects and lesions of brucellosis (Tessaro 1987).

5. **Hybrid bison are the best animals to retain in and around Wood Buffalo National Park because they should demonstrate what is called "hybrid vigor" in cattle.**

Response:

The panel may wish to refer to the genetic consultant (Dr. Roy Berg) and to the authority on the genetics of bison (Dr. Stan van Zyll de Jong). No genetic basis for resistance to brucellosis or tuberculosis has been detected in cattle and it is highly unlikely that hybrid bison are any more or less resistant to these diseases than either wood bison or plains bison: B. abortus and Mycobacterium bovis will be maintained and will cause disease in bison populations regardless of the breadth of the gene pool.

It may be academic to speculate on potential benefits of a broader gene pool: these unspecified benefits are currently over-ridden by the deleterious effects of the diseases, and other factors, on the declining bison population in and around Wood Buffalo National Park. Wood bison in the Mackenzie Bison Sanctuary appear to have adapted and multiplied very well under similar environmental influences, but without brucellosis and tuberculosis, despite a suggestion that they are "genetically impoverished" (Geist 1990). Berg (1989) has stated that, "The present recovered wood bison population has exceeded the critical population size demonstrating sufficient genetic variation to assure viability and survival".

6. **If an infected herd of cattle is left alone, brucellosis will "run its course", leaving the animals immune to the disease.**

Response:

There have not been recorded cases of brucellosis "running its course" and then disappearing from any sizeable population of primary reservoir hosts. Brucellosis is a highly infectious, chronic disease which will propagate itself indefinitely in these species. Clinical manifestation of brucellosis is most dramatic in newly infected herds of cattle, where large numbers of abortions can occur ("abortion storms"). Once established in a cattle population, the incidence of abortion usually declines but the disease continues to manifest itself as periodic cycles of herd abortions, sporadic abortions, reduced fertility, delivery of weak and/or non-viable calves, lowered milk production, orchitis, and arthritis. The disease does not leave the herd, it merely becomes less noticeable. The presence of antibody titers in a substantial number of animals in a herd heralds the presence of the disease, not "immunity". Individuals within chronically infected herds will periodically shed brucellae, which maintains the disease within the herd and can result in the spread of brucellosis beyond the herd.

Ms. Day's comments referred only to bovine brucellosis. In the case of the bison population in and around Wood Buffalo National Park, the concurrent problem of bovine tuberculosis (M. bovis) must also be considered. Both diseases are reportable under the Animal Disease and Protection Act, and both are equally difficult to control: there is no treatment, no vaccine, and no entirely reliable test to distinguish infected from non-infected animals within a diseased population.

Literature Cited:

Berg RT. Report to the Northern Diseased Bison Environmental Review Panel on bison genetics. In the Compendium of government submissions & technical specialist reports in response to the Panel information requirements document, October, 1989.

Clarke NP. Diagnostic discussion. In Crawford RP, Hidalgo RJ, eds. Bovine brucellosis: an international symposium. College Station: Texas A&M University Press, 1977: 79-99.

Crawford RP, Adams G, Richardson BE. Correlation of field strain exposure with new cases of brucellosis in six beef herds vaccinated with strain 19. J Am Vet Med Assoc 1988; 192: 1550-1552.

Davis DS, Templeton JW, Ficht TA, Adams LG, Thorne ET, Kopec JD. Evaluation of adult strain 19 vaccination in American bison. 37th Ann Conf Wildl Dis Assoc, Aug 7-11, 1988.

Davis DS, Templeton JW, Adams LG, Ficht TA, Simpson TR, Thorne ET. Brucella abortus in captive bison. III. An evaluation of calfhood strain 19 vaccination. 38th Ann Conf Wildl Dis Assoc, Aug 13-17, 1989.

Dohoo IR, Wright PF, Ruckerbauer GM, Samagh BS, Robertson FJ, Forbes LB. A comparison of five serological tests for bovine brucellosis. Can J Vet Res 1986; 50: 485-493.

Forbes LB. Bacteriological, serological, and epidemiological studies of Brucella abortus in cattle. M.Sc. Thesis, University of Saskatchewan, 1983.

Geist V. Northern diseased bison: a rebuttal of agriculture Canada's arguments to eliminate bison from Wood Buffalo National Park. Submission to the Northern Diseased Bison Environmental Assessment Panel, January, 1990.

Hornitzky M, Searson J. The relationship between the isolation of Brucella abortus and serological status of infected, non-vaccinated cattle. Aust Vet J 1986; 63: 172-174.

Huber JD, Nicoletti P. Comparison of the results of card, Rivanol, complement-fixation, and milk ring tests with the isolation rate of Brucella abortus from cattle. Am J Vet Res 1986; 47: 1529-1531.

Lambert G, Amerault TE, Manthei CA, Goode ER. Further studies on the persistence of Brucella abortus in cattle. Proc US Livestock Sanit Assoc 1960; 64: 109-117.

McCaughey WJ, Carlisle J. Antibody studies in an island cattle population free from brucellosis. Vet Rec 1970; 86: 250-252.

Nelson C. Immunity to Brucella abortus. In Crawford RP, Hidalgo RJ, eds. Bovine brucellosis: an international symposium. College Station: Texas A&M University Press, 1977: 177-188.

Stemshorn BW, Forbes LB, Eaglesome MD, Nielsen KH, Robertson FJ, Samagh BS. A comparison of standard serological tests for the diagnosis of bovine brucellosis in Canada. Can J Comp Med 1985; 49: 391-394.

Tessaro SV. A descriptive and epizootiologic study of brucellosis and tuberculosis in bison in northern Canada. PhD Thesis, University of Saskatchewan, 1987. xxi + 320 p.

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February 20, 1990

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Northern Diseased Bison
Environmental Assessment Panel,
510 - 750 Cambie Street,
VANCOUVER. B.C.
V6B 2P2

attention: Colin Lachance
Executive Secretary

Dear Mr. Lachance,

re: Addendum to Background Report on Heritage Conservation Perspectives

Following submission of the Background Report on Heritage Conservation and completion of public hearings, there are one or two matters pertaining to heritage conservation perspectives on bison that may benefit from amplification. The information is provided in the attached Addendum.

It is hoped the observations will be useful to the Panel in its deliberations.

Yours sincerely,

Robert C. Scace.

Robert C. Scace Ph.D.
Geographer

attach.

ADDENDUM

BACKGROUND REPORT

HERITAGE CONSERVATION PERSPECTIVES ON BISON IN THE CONTEXT OF WOOD BUFFALO NATIONAL PARK

Robert C. Scace

1.0 PREAMBLE

The Background Report on Heritage Conservation Perspectives was completed in November 1989 and final public hearings for the Panel Review conducted between January 16 and 26, 1990. The writer attended the Technical Sessions (Fort Smith, January 22-23; Edmonton, January 25-26).

During the Technical Sessions questions and some discussion focussed on "heritage," "heritage conservation" and "heritage values" insofar as these terms relate to bison futures in and about Wood Buffalo National Park. The Background Report identified heritage as an organizing concept and went on to state that heritage, in part, is about human-ecological relationships:

> about interactions between land uses or cultural processes such as agriculture, mining, forestry, roads, transmission lines and other infrastructure, and biophysical processes that may include floods, fires, changes in wildlife populations and changes in grassland and forest composition (p.2.3).

Consideration of alternative courses of action for diseased and hybrid bison in the national park area necessarily invokes assessment of many of these interactions, and in so doing brings into focus the fact that bison futures in the park are indivisibly associated with many other contemporary resource management problems, issues and concerns. These have been stated to include, for example, the matter of land claims settlement and cooperative wildlife management, the effects of regional economic development activities on park biota, access to and use of park land for both consumptive and non-consumptive purposes, and the formal status of the conservation area as National Park and World Heritage Site in the context of significant landscape change. Importantly the potential exists in several situations for negative interactions regardless of the disease/genetic status of the bison population. Thus replacement of diseased bison with a healthy bison population does not necessarily render the replacement herd immune to a range of regional land use activities that may precipitate negative impacts over the long term.

From the perspective of long-term heritage conservation, therefore, it is desirable to examine the range of potential interactions between bison and existing, proposed or potential land uses and associated land use plans. Detailed resource management and conservation plans exist for Wood Buffalo National Park, but the long-range resource management process for Alberta public lands surrounding the park has not advanced to the plan preparation stage. To exemplify these potential interactions between bison and future land uses and to demonstrate difficulties in boundary (buffer) area management in the absence of resource planning guidelines respectively, two matters are discussed below. The first relates to the implications for bison management associated with extension of Alberta Highway 58 to Peace Point in the park.

The second addresses the low priority currently ascribed to integrated resource planning in the vicinity of Wood Buffalo National Park and hence the absence of an appropriate context within which to address implications of buffer area options for bison management.

A third matter addressed is the World Heritage Convention. The status of Wood Buffalo as a World Heritage Site and some perspectives on bison management options in regard to the Convention were addressed in the Background Report. The workings of the World Heritage Committee were not presented, however, and some information is included to provide details on the subject.

In essence the Addendum points to the fact that whatever option is proposed for resolution of the northern diseased bison issue, bison in the Wood Buffalo National Park area will continue to be exposed to regional economic and social changes over the long term. Some of these changes may be substantial in terms of their implications for a bison population - as well as the heritage status of Wood Buffalo - and this long view should not be lost in recommendations respecting diseased bison futures. Where uncertainty reigns interim measures may be desirable pending comprehensive appreciation of human-ecological relationships.

2.0 ROAD BUILDING AND BISON

The prospect of a road linking Fort Vermilion and Peace Point has been actively considered for over 30 years. The initial survey took place in 1957 and about 116km were cleared. Development of the road is being actively pursued at this time by interested parties such as the Town of Fort Smith.

The Canadian Parks Service recognizes transportation requirements in the region and associated aspirations of regional residents and groups. The Wood Buffalo National Park Management Plan states the national park authority "will accept in principle, the development of a road from Peace Point west, along the Peace River to the west park boundary (116km) should the construction of the road be justified in regional transportation studies" (p.84; see Attachment I). The Canadian Parks Service recognizes that the road has potential for "causing significant negative impacts on park resources directly as a result of construction and maintenance and indirectly through increased access and conflicts with wildlife and other heritage resources" (Canadian Parks Service, Park Conservation Plan, Entry UM-Cm2, 1988).

The Peace River Road would follow the general alignment described in Initial Investigation, Peace River Road, Wood Buffalo National Park (Reid Crowther & Partners Ltd., 1982).In the report this writer addressed a number of environmental considerations associated with highway construction - a development which would also require upgrading of the existing Peace Point-Fort Smith road. One matter discussed was the relationship between a Peace River Road and park bison (see Attachment II).The potential of an extended Highway 58 to facilitate contact between diseased bison and domestic stock was recognized in the report, which also stated: "there is a need to more thoroughly understand the relationship that exists (between bison and roads as travel corridors) and would prevail in future were the road to be constructed. A bison monitoring program...would be an essential prerequisite to evaluation of the effects of the road."

3.0 INTEGRATED RESOURCE PLANNING IN THE VICINITY OF WOOD BUFFALO NATIONAL PARK

Public lands in Alberta may be subject to the Integrated Resource Planning (IRP) process, coordinated by Alberta Forestry Lands and Wildlife. Local, sub-regional and regional plans may be prepared: for the region of interest respecting the northern diseased bison only one local or sub-regional plan has been prepared - B3, Jean D'Or Prairie Sub-Regional Plan. (The plan and an index to all planning initiatives have been filed with the Panel previously.) Planning has not been initiated for eight sub-regional areas that lie immediately adjacent to Wood Buffalo National Park (B4, B5 and B8; C4 to C8 inclusive).

At the regional level activities associated with preparation of a Peace River Regional Integrated Resource Plan (PRRIRP) have been under way for a number of years. Terms of Reference (Attachment III) were issued in November 1987 for preparation of a plan with four main purposes, including broad policy direction for management of provincial public land and resources so as to enhance the effectiveness of present and future resource management. Several resource issues of concern were identified, including agricultural expansion.

Between January 1988 and August 1989 three Planner's Updates were issued on the PRRIRP process (Attachment IV). The most recent (August 1989) observes that of several resource sectors and major regional issues reviewed and analyzed by the planning team, "the most contentious item was agricultural expansion, its constraints and the effects on other resources such as forest land and wildlife habitat." In certain areas (e.g., Kakwa Wapiti and vicinity of Lesser Slave Lake) the status of land use and resource management issues is said to create requirements for planning "to resolve problems and provide resource management directions." Elsewhere, however, in locales such as Hay Zama and the Caribou Mountains, "the issues are not critical so that planning is not a high priority at this time." An initial draft plan for the Peace River Region will be produced at some future date.

The viability of buffer options for bison management must be doubtful in the absence of clear guidelines respecting future land use activities in the area of the buffer zone.

4.0 THE WORLD HERITAGE CONVENTION: HOW IT WORKS

Observations were provided in the Background Report on Wood Buffalo National Park as a World Heritage Site and home to diseased bison. The World Heritage Convention, the device through which World Heritage Sites are established, was also introduced. In light of questions raised during the public hearings additional information on how the World Heritage Convention works may be useful. To this end Attachment V reproduces a Unesco description of the Convention. In keeping with established procedures whereby it monitors the state of conservation of listed sites, the World Heritage Committee is actively monitoring the progress of the Northern Diseased Bison Environmental Review Process.

ATTACHMENT I

Extract from Wood Buffalo National Park Management Plan

i) New Roads

The existing road system generally serves the current and projected needs and requirements of the park in terms of visitor use and for operational purposes. The existing road network also serves regional requirements. Highway 5 not only provides access to the park but Fort Smith as well. The winter road serves park operational requirements, and also provides the sole surface transportation route to Fort Chipewyan. The west side of the loop road which serves primarily park requirements, also provides access to the settlement at Peace Point. An additional road providing access to the region from the south has long been pursued as an objective by groups and individuals in the region. Such a road is directly influenced by the park, due to its location and size. Several potential alignments for this road have been investigated. Two of the three potential routes would traverse park lands for a portion of their alignments.

Park Loop Road

Parks Canada recognizes the transportation network requirements in the region and the aspirations of regional residents and groups. Factors that also must be considered when assessing regional roads include the degree to which regional transportation objectives can also be reconciled with park objectives, and the impact on the park of any new road developments not specifically required for park purposes.

Parks Canada will accept in principle, the development of a road from Peace Point west, along the Peace River to the west park boundary (116 kms) should the construction of the road be justified in regional transportation studies.This road is accepted as a component of the regional transportation network and cannot be substantiated on the basis of the Parks Canada mandate alone. Benefits in terms of increased visitation and greater appreciation of the park environment would be realized with the construction of the road but these benefits do not in themselves warrant the construction of the road. Similar benefits can be achieved at considerably lower cost and with less impact through other developments and programs.

A Peace River road has the potential to create negative environmental and socio-economic impacts. This proposal therefore could only proceed to development if environmental and socio-economic impact assessments determined that impacts were of a magnitude that could be tolerated, or could be mitigated to a level that was considered acceptable. Both assessment processes therefore would have to be carried out prior to a formal decision to proceed with development being made.

Parks Canada, as part of the implementation of the management plan will continue discussions with other governments and agencies involved in transportation in the region. These discussions will focus on future road requirements, including a Peace River road.

Should the Peace River road proceed, Parks Canada will not contribute to construction costs. Financial involvement would be limited to providing technical and design assistance to a proponent and the development of a modest interpretive facility at Garden Creek. Parks Canada likewise would not participate financially in the maintenance of a Peace River road since the road would not directly serve park purposes.

The right-of-way for a road would continue to be owned by Parks Canada. The formal status of the road right-of-way would be established during negotiations with a proponent, prior to construction.

A Peace River road will conform to Parks Canada highway design specifications and standards and will follow the general alignment described in the report 'Initial Investigation - Peace River Road, Wood Buffalo National Park', (Reid, Crowther and Partners Limited, with Thurber Consultants Limited, 1982). The development will be subject to the Environmental Assessment and Review Process and Socio-Economic review procedures.

A road along the Peace River represents the only southern access road, involving park lands, considered acceptable by Parks Canada. Other southern access routes which would traverse park lands are not acceptable to Parks Canada. A southern road access on the east side of the Slave River and outside of the park would be supported by Parks Canada.

ATTACHMENT II

a) Bison

A number of bison move in and through the study corridor year-round and their range appears to be expanding. This phenomenon is partially attributable to, and complicated by, recent extensive forest fires. Presently the Peace Point road is an attractant to bison both as an avenue of movement and habituation (NWT Highway 5 seems to serve a similar purpose). Low levels of traffic use have, to date, kept to a minimum problems of bison-vehicle conflict, but they have occurred and the potential for an increased incidence of accidents on a highway from Garden Creek to Fort Smith must be anticipated.

Casual observation of bison on the Peace Point road shows that they are not necessarily frightened by approaching vehicles and their movement off the road is usually very slow. In the fall of 1981 their attraction to the road was accentuated by extensive ditchside grass growth in the wake of extensive forest fires.

Bison already are frequenters of the Peace River Road alignment and use it in part, to exit the park to the southwest. Because of their history of disease these animals are considered a potential threat to expanding domestic stock populations immediately west of the park.

The relation between bison and the future status of roads in Wood Buffalo clearly is an important matter. Some recommendations concerning standards for a Peace River Road in light of this situation are provided in Section 4.3. Clearly, however, there is a need to more thoroughly understand the relationship that exists and would pevail in the future were the road to be constructed. A bison monitoring program therefore, would be an essential prerequisite to evaluation of the effects of the road. From this would come desired information on highway speeds, right-of-way width, potential for migration and so on.

source: Reid Crowther & Partners Ltd. 1982, p.5.4-5.5

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Submission to the Northern Diseased Bison Environmental Assessment Panel

by

Daren R. Ure

Doctoral Candidate
University of Alberta

February, 1990

INTRODUCTION

The issue of the diseased bison in Wood Buffalo National Park (WBNP) is one from which most of the public are physically removed. However, the issues are of terrific moral value to us. The matter is not confined to the framework of its particular details. It is more than an issue of bison, disease, and the hybrid status. We must be concerned about the conceptual foundation of the issue. In other words, we must "see the forest for the trees". I am a doctoral candidate with backgrounds in zoology and cell and molecular biology. My future will see much turmoil in the Canadian wilderness, as we wrestle with our priorities. This is my part to endorse the understanding of this wilderness so that we may realize its full inherent value and the role which Man must play.

This submission shall consist of 3 parts. The Problem will investigate the definition of the problems regarding the bison. It is my concern that either the resources weren't available to properly address the problem or judgement of the true problem was swayed. The Consequences will investigate the ramifications of Agriculture Canada's replacement proposal and will provide support for alternate measures. The final section will be Closing Remarks. The information in this document has been obtained largely from Agriculture Canada's Submission to the NDBEAP (November 17, 1989), the NDBEAP Compendium of Government Submissions and Technical Specialist Reports in Response to the Panel Information Requirements Document (October, 1989), the NDBEAP newsletters, and the 2 days of public hearings in Edmonton in January, 1990. All quotes have been obtained from these sources unless otherwise stated.

THE PROBLEM

As outlined in the January, 1989 newsletter (tabloid), the issue involves 2 immediate problems:

1) Bovine tuberulosis (TB) and brucellosis present a health threat to people, cattle, and other bison.

2) Hybrid bison pose a threat to the health and genetic integrity of reintroduced herds of wood bison.

It is stated that there is added immediacy to the issue because of increasing advancement of agriculture and the present healthy state of Canadian cattle herds. The risks to disease-free bison and to user groups are also restated. I do not disagree that the status of the bison could be more favorable than it stands today. However, I feel that the bison problem has not been adequately defined. It often happens that one or more parties' reactions to a particular event hastily sets the framework of the problem. By simple analogy, a parent's dismay upon suspecting a child's substance abuse easily turns into criticism of the environment before the parent realizes that the child himself may be the ultimate source of the problem. The present issue seems to have followed such a model. The party which has expressed its discontent more strongly than any other is the agricultural sector. It views the bison as the risk to the industry, and thus the bison passively became labelled as the problem from the start. It was not until reactions from other groups arose that the "problem" was put into fair balance. It is now recognized that agricultural encroachment may have every bit as much to do with the issue as the diseased bison. Yet, the force of precedent is not easily halted, and the threat of bison continues to be a primary concern. It must be remembered that the real problem should be defined only after examining every side of the issue with equal weight.

It is therefore with a considerable lack of sympathy that I regard the agricultural sector's cries. Their view of the problem is naive, and their assessments of the disease threat is unsubstantiated. I believe that the historical nature of free-roaming bison in the North does carry some significance. Alberta Agriculture seems to agree, in that they consider that one reason why a buffer zone shouldn't be erected is because "cattle-raising has a historic precedence over the Park and the diseased bison" (Fort Vermillion 1780's). It is surprising that they should try to place value into such a point, since agricultural presence can not compare with the historical presence of the First People and the original bison. Secondly, their statement openly implies that no park boundaries or bison population should stand in the way of agricultural use of the land. The AgriTrends Research Inc. submission complies by reporting that the ideal conditions for agricultural interests consists of no possibility of cattle-bison contact (diseased or non-diseased), no resource competition, and no restriction of land use. Their goals are being realized. They state that the cattle population in the vicinity of the Park (0-100 km) appears to be trending higher and Agriculture Canada admits that mixed agriculture has moved closer to the Park in recent years. AgriTrends: "The demand for public grazing reserves will increase and an obvious source of land appears to be in northern Alberta and Saskatchewan." They add that agricultural risks and costs could be minimized by depopulating all bison and repopulating once it suited the cattle industry, and if the bison numbers were to become too high that more isolation measures be installed. These goals display no regard for resource or wilderness conservation (of which bison are a part), whatsoever. It is this type of deplorable mentality that has made the earth what it is today. There has to be a limit to which the land is exploited. The ethical, cultural, and ecological reasons are too numerous to be taken for granted. No agency, group, or industry should expect that there will be no restrictions or risks to advancement! Yet the cattle-raising industry, by moving toward more intensified production and thus a self-imposed higher risk of disease transmission is calling upon the environment to "clear the way" for them. Cattlemen are shirking their responsibility by not restraining the industry when restraint is necessary. Everything in this world comes with a price. Finally, it is evident in one of the three recommendations of the AgriTrends submission that part of the reason why bison have been chosen as the problem is that there is some form of conflict within the the livestock industry itself. It was recommended that cattle interests in the vicinity of the Park be given fair treatment as compared to elsewhere in the province. This inner concern does not warrant that the bison be given additional distinction as the "problem" due to scapegoat reasons. I feel that the attitudes of the cattle industry as a whole have irresponsibly led to an inaccurately defined problem of disease transmission to cattle. Livestock encroachment upon the bison and the rest of the natural landscape is obvious and is very much a part of the real problem.

The attitudes of the agricultural sector is reflected in the sometimes inflated assessment of the risks of disease transmission to cattle. AgriTrends states that if the status quo is maintained, contact opportunities would be created. In fact, these opportunities have existed for decades. Especially since population levels at present are only one-third of past (and possibly prolonged) levels and are continuing to decline, it is contradictory that some parties claim that risks are increasing because of bison. Proponents such as the Alberta Cattleman's Association reply that there have been an increased number of sightings outside the Park. Can this not equally suggest that there are just more people to make the sightings, and that strays have remained the same in number over the years? Also, it must be remembered that information flow has been on an upswing in the recent ages. What are the nature of these increased sightings and the riskss?It was stated at the public hearings that cattlemen are required by law to have all livestock fenced. Certainly, fencing must be some deterrant for the passive bison to come into contact with cattle or pasture. Have these increased risks involved bison trying to emmigrate onto cattle land? (Does this imply a trend in bison sexuality towards domesticated cows?) Although my knowledge is limited, the risk of the described events seems minimal. There have been no cases within the WBNP region whereby either tuberculosis or brucellosis has been transmitted to cattle from bison despite expanding public grazing reserves and private operations. This suggests that the present risk is much lower than cattlemen imply, and it is difficult to imagine from a practical standpoint that the risk will increase exponentially over the next few years. The bottom line is that we need to quantify the risk. In nearly every case of concern over health issues in which there is much speculation, governments impose a maximal standard of acceptability. This is evident from pulp mill effluents to oxide emmisions. With a lack of hard knowledge, risks are allowed to the public. The risk that the bison impose upon cattle falls much closer to the realm of acceptability than what has been largely emphasized.

It is well known that Brucella abortus and Mycobacterium bovis can be transmitted to the human population, most likely via direct lesion or conjuctival exposure, and possibly via aerosol exposure. It is unlikely that TB can be transmitted from bison meat to humans, due to the virtual absence of the pathogen from muscle tissue and to adequate cooking. The symptoms of the diseases show considerable variability in humans. Despite the potential for transmission, the Canadian, Alberta, and Northwest Territories government health agencies have reported that there have been no significant numbers or in fact no such transmissions of these diseases to humans in the WBNP area. Of course, it is possible that human infection has occurred but has gone unrecognized, given two reasons: the social or cultural status of the people likely to have been infected; and the fact that "most human infections (of brucellosis) are asymptomatic or produce non-specific signs and symptoms that are rarely life-threatening". Levels of M. bovis infection have been reported to be correspondingly low in Ontario and B.C. In these provinces, between 1964 and 1976, only .42% of all human TB cases were of the bovine type. Hunters claim that the disease rate among bison is closer to 10%, although I would agree that the rate is closer to Tessaro's report of 43% (one or both diseases). Nonetheless, they and the native population as a whole are the groups which have demonstrated the most contact with bison which have been diseased since the 1920's. Yet, as Theresa Ferguson reports on behalf of a large proportion of the Native harvesters, the handling of the bison over the decades does not seem to have proved detrimental to their health. These lines of evidence favor the position that the risk to human health has existed for a long time but at very low levels.

The risk of transmission that the agricultural sector is implying rests largely upon the assumption that those bison which are potentially in contact with cattle do harbor either disease. While it is not unreasonable to suppose that the proportion of migratory bison which are diseased displays equal ratios to the diseased numbers of the herd as a whole, the distribution and dispersal of the diseased animals has not been clarified. More information on this matter may be available in Tessaro's thesis, but he limits his report in the Agriculture Canada submission to only an overall percentage rate. Theoretically, diseased animals in general do not have the energy capacity to emmigrate long distances, thus shifting the distribution patterns. Besides, bison primary ranges are located in the eastern regions of the Park. The cattle-raising district around Fort Vermillion to the west is adjacent to bison secondary ranges. Whereas secondary ranges comprise seven times the area of primary ranges, they are home to only about 12% of the bison. It may be that my search for literature on this matter may have been technically hindered; conversely, there may be a real lack of information on (diseased) bison distribution and dispersal that makes empirical risk analysis difficult to define.

Another point regarding risk of disease transmission to livestock involves the question of overlap of resource use and microhabitats between bison and cattle. Stated otherwise, given that the two species share a common area, to what degree do they also share forage, resting areas, etc. that are potentially condusive to cross-infection? All conclusive evidence to date is restricted to scenarios in which bison and cattle are kept within the same fenced area. This experiment proves that transmission is possible but the model is somewhat biased, since animals are forced to share common ground (and how much?). Also, what were the time frames and habitat conditions of the experiment, and what is the probability of interspecific transmission given that animals are in contact directly vs indirectly? The only "in vivo" situation, in Wyoming, provided only circumstantial evidence that bison and/or elk were responsible. A common and important consideration of good science is that all experiments should be repeated at least once with similar results before the findings can be safely accepted. I suggest that a better knowledge of the probabilities be experimentally acquired before an accurate assessment of the risk of disease transmission is made.

The risk of transmission between the WBNP and Mackenzie Bison Sanctuary (MBS) populations is likely to be higher than the risk to cattle for intuitive reasons. However, this risk assessment, too, is subject to potential differences in the distribution of diseased bison and their movements, on which more information needs to be attained. If infection of the MBS herd did occur, the Wood Bison Recovery Program would have more problems with which to deal. The infection of that population would be detrimental to the bison as a whole, but as described ahead, the effects upon the wood bison may not be as serious.

There is a common occurrence in society whereby one idea becomes accepted as fact when there is lack of evidence to refute it. It is also common that as more energy is invested into a project, there is less likelihood that the project can be reversed. In this case I refer to the taxonomic status of the bison. The designation of wood bison as a distinct subspecies is based upon obvious phenotypic differences and the statistical morphometric analysis of C. G. van Zyll de Jong (1986). As noted earlier, it is unfavorable that only a single study serves as a foundation for future decision-making. As it stands today, there exist two groups of bison which have been accepted by the general public to be pure bison subspecies. This opinion has snowballed from a time when there was a lack of hard scientific evidence for the true distinction. It is this general acceptance on which has been built the Wood Bison Recovery Program. The program is dedicated to the removal of the bison from the list of endangered species. Although the momentum of the program is such that this panel would find it imposing to temporarily retard or even question the program's efforts, I ask that the panel consider it on the basis that more scientific evidence is required about the real taxonomic dissimilarities between plains and wood bison and the reasons for them.

Two noteworthy people have made claims that what today we call wood bison and plains bison are not taxonomically different. Dr. Patricia McCormack has stated that instead, they are only geographical variants of the same species. She added that there was an inadequate data base used in van Zyll de Jong's 1986 study. Dr. Valerius Geist, a large mammal and especially deer expert, agreed that the technique used by de Jong differentiates only populations, not taxons. He reported that he has observed gross phenotypic changes of bison kept in captivity, indicating that some characteristics are highly responsive to alternate environments, and that these changes do not occur on an evolutionary time scale. Historical separation, not isolation, of the bison over a relatively short time span is a very plausible explanation for the subtypes that are present today. The mechanisms of such change, acting over the past five decades, may even be evident today. Dr. Lu Carbyn, speaking at the Provincial Museum on January 28, 1990, reported that the majority of the bison which he has observed at WBNP are more characteristic of the wood bison type. This occurs despite the fact that plains bison outnumbered wood bison by about four times when the former were originally shipped from the overcrowded Wainright herd. The basic size differences between the bison groups can easily be attributed to the well known fact that within most species, more northerly-situated populations consist of larger animals. The evidence that can pinpoint evolutionary change lies in the fields of biochemistry and molecular biology, the latter of which especially has progressed exponentially from a barely visible state ten years ago. Dr. R. T. Berg's report on bison genetics appears biased towards an acceptance of subspecies status, "Attempts to find genetic markers which might be useful for distinguishing members of the two subspecies and their hybrids have to date been unsuccessful". By my interpretation the statement is saying that the bison can not yet be assigned to subspecies groups. As a personal note, I would like to add that, as I have training in current molecular biology, I can say that the techniques are available today for extensive DNA analysis. All that are needed are time and labor. Thus, the skepticism about the bison's taxonomic status can be potentially clarified using scienctific analysis. The taxonomic status of the bison serves as a foundation for the second most important issue on the panel's table, that of wood bison integrity. The arguments of the issue retain little validity until the former discrepancies are cleared.

The hybrid status is viewed by many EuroCanadians as unfavorable and even as a gross human error. This position is probably not as harsh as people have been led to believe. Native groups, whom are most involved with the bison, do not consider their cross-bred state an issue. Dr. Geist has pointed out that multi-speciated large mammals, such as deer and sheep, are known to interbreed across the species in the wild. Dr. Berg's report also states that cross-breeding freely occurs between bison subspecies. There is no reason to believe that plains and wood bison didn't themselves interbreed during historical periods. As late as 1866 there was contact between the two groups. There are no geographical barriers that would isolate the two bison types and necessitate evolutionary divergence. The historical separation of the bison obviously could not have been absolute. It is impossible to determine to what degree an exchange of genetic material occurred, now that only a small fraction of the great herds remains, but some exchange must have occurred. Although we do not understand the mechanisms at play, Nature must have devised a means by which wood bison and plains bison could retain their distinctions. If these mechanisms did not exist in the face of interbreeding, then there would not be today two alternate phenotypes! Man should not underestimate Nature's powers. Parks Canada deserves merit for its primary objective in the WBNP Management Plan: to allow park bison to be regulated by natural means without human influences. This objective should be considered very seriously. The interbreeding of plains and wood bison, in all likelihood, occurred naturally. Our ignorance of that event and of the mechanisms of differentiation should not substantiate the argument that hybrid bison are undesirable.

THE CONSEQUENCES

I do not view Agriculture Canada's Replacement proposal as practical or ecologically sound. One of the main reasons is that I doubt the feasibility of complete eradication. This portion of the program is by far the most crucial, expensive, and the least likely to be sufficiently completed. It entails that the diseases, and not solely the bison, are eliminated to the extent that there could be no chance of reinfection of later bison herds. In the interests of Agriculture Canada, the goal should read that there's no longer any chance of infecting livestock from any source. To eliminate every last bison from a densely forested area of approximately 45,000 km squared is a gigantic goal which would not be easily achieved, especially over the course of 3-4 years. Agriculture Canada recognizes that there are a number of logistical problems which first have to be identified. One concerns the methods of depopulation. The Canadian Parks Service is not disposed to the creation of public hunting in the Park. This restriction would not sit well with Native groups who want to be directly involved with whatever management plan is employed. The Park

Management Plan also requires that the depopulation program be refined in order that it is more in line with the National Parks Act. As the Alberta Fish and Wildlife Division has stated, it will be impossible to avoid shooting some animals from the air. Word of these actions will not be looked upon lightly by the public eye. Hay-baiting is also proposed to be used widely. If the replacement is to proceed as quickly as possible, it may be necessary to import hay for this purpose, as well as for feeding bison holding corrals. Introduction of foreign plant species into the Park by these methods is not within the present guidelines of Parks Canada. Agriculture Canada proposes that bison, once killed, could be used as dog or mink food or sold commercially to international markets in the form of meat and various by-products. How can they so easily neglect the regulation of the Alberta Wildlife Act that trade in wildlife is prohibited? The Act makes accomodation by stating that hybrid bison products can be sold, but there is no agency that has the knowledge or should have the authority to declare all 4000 bison as hybrids. Do bison with 95% wood bison genes still constitute hybrids from a practical standpoint? Experts in the field agree that what we call wood bison today may in fact not be real wood bison, but only the closest thing to them. Therefore, are not all bison technically hybrids? Proponents of the replacement option have passed over some of these considerations.

The time frame of depopulation/repopulation plays an important role in the ecology and the principles of WBNP. In the Peterson and Peterson submission on vegetation dynamics, the conclusions section does not summate the replies to the unanswerable questions. In particular, the investigators do not know if there would be any differences in vegetational changes over a short depopulation phase versus a prolonged one. They also do not know if removal of bison grazing in WBNP would encourage invasion of woody species into primary bison habitat, dry and wet meadows. However, they do comply that this is a natural successional trend. The investigators claim that browsing by an increased moose population could potentially offset shrub invasion. They state that in the Slave River Lowlands

(SLR), the moose population increased at the same time that the bison population decreased. A similar scenario may not exist if bison are completely exterminated, as wolf predation may be expected to limit the migration of moose into the former bison ranges. It is logical to estimate that long-term depopulation would augment the above changes if they were to occur, as compared to short-term depopulation. The uncertainty of the effects of wolf predation on moose dynamics, that is brought forth by Dr. François Messier, makes no mention in regards to the depopulation time frame. I expect that he considered the possible consequences based only on the single time frame proposed by Agriculture Canada. Again, more considerations arise if wolf populations are allowed more time to migrate farther into moose ranges. In regards to the low impact of wolves on moose, which he supports, he exemplifies the gradual ten-fold reduction in bison in the SLR with little effect on calf/adult ratios. However, is it possible that a critical bison number was not yet reached over the 20 year span? The depopulation plan calls for complete elimination over at least ½ of that duration. The impact of a prolonged depopulation extends beyond vegetational and predation effects. The free-roaming bison are a key draw of tourists to the Park. Their long absence would certainly curtail flow of tourist revenue to the area. Bison serves as a meat source for Natives around WBNP, although it is not the primary one according to the Northwest Territories Department of Renewable Resources. Still, bison depopulation could create troubles over many years for those who regard bison as an important food source. The ramifications of prolonged absence of bison are many.

There is good reason to believe that the depopulation phase could extend beyond the estimated minimum of seven years. Agriculture Canada admits that the removal would be a difficult job and that "a precise time frame can not be predicted for depopulation". This kind of task in the northern Canadian wilderness is unprecedented. At the public hearings in Edmonton, Agriculture Canada spoke about similar attempts in New Zealand, Australia, and Hawaii. While much can be learned from previous experience, for the most part, the conditions varied from the present situation. It is noteworth that the attempted elimination of wild buffalo in Australia halted at about 70 animals, due to expense. Also, if I heard correctly, there was a problem of back-immigration. The general consensus is that most of the depopulation could occur relatively quickly, but the last few animals would be the most energy-demanding to remove. The Canadian Parks Service agrees, "It is possible that the remaining 10% of the bison will demand 90% of the depopulation costs." One factor that makes the attempt difficult is that the far-straying animals are frequently lone bulls. Finding lone animals is more demanding that finding herds. According to Agriculture Canada's plan, depopulation must be completed prior to the release of disease-free animals. Specifically, they outline that there must be a four year period in which no bison are spotted in the Park and surrounding area. This allows only 3 years to eliminate all bison if the project is to be completed as planned. This may be an unreasonable goal, given that not a single animal should remain. All it takes is one animal to transmit the disease back to healthy bison. And then what? The question also arises about the risks of infection from secondary sources back to the bison. Dr. Mitchell Essey, a leading epidemiologist of bovine TB, made us aware that when primary sources of TB are eliminated, TB is generally lost from secondary sources. Does this hold equally true for B. abortus? Since aerial slaughters would increase the number of field carcasses, would there not be higher transmission rates to predators and scavengers and more possible side-effects? There is much more speculation than confidence about how long the replacement program would take and about the success of establishing zero-risk populations of bison or other potential disease vectors.

It is readily evident that I do not support Agriculture Canada's Replacement Proposal at this time. Instead I offer what I feel to be more appropriate measures. They could be implemented for a five year period, after which time the situation could be reviewed again.

1] Create a bison-free buffer zone between WBNP and MBS, consisting of fencing and surveillance. This is intended to reduce the risk of disease transmission to the MBS population. The serveillance aspect is expected to cost $115,000/year, not including manpower, by NWT Dept. of Renew. Res. estimates. This works out to two hours of flight time per day for five months and also includes funds for a number of air and ground follow-ups. Even an estimate of $250,000/year over five years adds up to only $1.25 million. In addition, there are also fire surveillance flights. Fences could be constructed in high risk and/or easily accessed areas. Alternatively, relocation of the MBS herd could be considered.

2] Limit bison ranching in the vicinity of the Park. Game ranching is a controversial issue within itself, of which there are many advocates and proponents. Whenever wild and "domesticated" animals are in close proximity, there is a moderate risk of interassociation, consequential barrier breakdown, and mixing. This poses a threat to both populations. Under the status quo, disease transmission may occur to ranched animals. Since the number of bison ranches in proximity to the Park is low to my knowledge, the effects of limiting the operations should not have dramatic consequences. Some compensation may be necessary. Alternatively, a program of subsidization of double-fencing and/or surveillance could be implemented. Despite the current situation, the impending operation in the Fort Smith area, are still willing to proceed with a pilot project with some modifications. Furthermore, and very significant in principle, the project is assuming the responsible role of absorbing the costs should contamination problems arise. Cattlemen should take note.

Double-fencing should likely be considered even if the replacement option is carried out, in the interests of the Wood Bison Recovery Program. The ranching operations involve plains bison. Their escape and mixing with wild wood bison herds would be unfavorable, especially if large numbers escaped during rut and recapture was difficult and expensive. Should genetic manipulation of domestic herds occur, the risk to wild populations would be even greater. An example is the recent escape of an elk-red deer cross from a ranch in northern Alberta.

3] Encourage the taking of bison in proximity to agricultural areas but outside of WBNP, especially by native groups. The regulations for this exist at the present time. This measure may involve setting quotas if bison distributions and abundance can be determined. This measure should alleviate the risks of disease transmission to livestock.

4] Construct double-fencing around cattle herds. It is obvious that Agriculture Canada places a high degree of faith into double-fencing as a means of isolating a herd of ungulates from other animals. Considering the amount of risk that bison pose to cattle, this option would be extremely effective. The cost, I firmly believe, should be borne by the farmer. However, if necessary, partial subsidization based on distance from the Park could be considered.

5] Educate all those groups who stand risk of infection about bison handling procedures. Owing to the good record of three health agencies, it is not expected that excessive amounts of money is required to execute this measure.

6] Research. There are too many questions that need to be answered before any type of replacement option can be followed through. Having the time to attempt to resolve them is the purpose of the five year interim. These results would largely decide the next steps to be taken. The following problems are just a few which should be investigated:

a) What is the distribution of diseased bison at present?

b) What are the probabilities of disease transmission when:

i: multiple species exist in the same area?

ii: multiple species share forage areas,resting areas, etc.?

iii: multiple species contact each other?

c) What are the risks of disease transmission from secondary to primary sources, and does this change when the secondary source increases?

d) What are the vegetational impacts of long-term vs. short-term absence of bison from their primary ranges? Are moose likely to increase in number and invade bison ranges as the bison disappear?

e) What are the primary factors responsible for the gradual decline of bison in WBNP and area? Are the bison adjusting to the diseases, especially since 60 years have passed under the influence of disease?

f) Do genetic differences exist between wood bison and plains bison that warrant subspecies status?

g) What role have biogeographical factors played in the expression of phenotype?

CLOSING REMARKS

It is excessively ironic that some people feel the need to spend millions of dollars to rid the WBNP area of its bison when, according to the report of Dr. Messier, the bison have been doing it themselves for the past 20 years at a rate of approximately 5% per year! It is hard to reason that they are posing any more of an active threat of tuberculosis and brucellosis than they have in the past. The livestock producers are bringing the threat upon themselves. Indications are that there is not a serious risk of disease transmission to humans, hence leaving the threat to cattle and wood bison as the main argument for the replacement option. Despite the prominence of the livestock industry in Alberta and Canada, I do not believe that they deserve any special treatment from the government, the public, or the land. Expansion can not proceed indefinitely without restrictions and barriers. It is not the responsibility of the environment to make way for them. The age of conquering forces over nature is slowly coming to a close, for the sake of the earth and its inhabitants. Fortunately, we are recognizing that all life has intrinsic value and that human well-being depends on all of it. Allowing the replacement option to be administered is another step forward for exploitation. Are there other government-funded programs to rid national park land of bears, wolves, grasshoppers, catepillars, or other "harmful" life forms to make things easier for producers. The livestock industry is not in dire straits here. In the February 19/90 issue of Alberta Report it was stated that Alberta's share of (cattle) kills has increased from 40% to 44% at the same time that Canada's total kills have dropped by 5%, and that Alberta is home to 83% of Canada's mother cows. Considering the proportion of Alberta's cattle that are in the vicinity of the Park, restricted use in that area is of low financial cosequence.

The problems of disease and hybrid status need to be better defined. There is some evidence that neither of these problems are as serious as they seem. Mostly, there is a lack of evidence for any position. We should not be too hasty in executing a plan as radical as the replacement option. It is more likely than not to have far-reaching consequences. The issue that confronts the panel was created by such hasty and naive actions. There was opposition to the transfer of 6600 plains bison from Wainright to WBNP in the 1920's, but officials didn't consider things carefully enough. Do we really know more, relative to the times, than they did 70 years ago! Nature has ways of adjusting itself. The First People know this all too well, and this is why so many of them oppose the replacement option. Some people argue that this case is exceptional because the diseases are "unnatural". I argue that the division between unnatural and natural is arbitrary and that it trends away from clear distinction as populations are given time to adjust. Wherever disease originates or however it is transmitted, it is all a part of the whole, the natural. We, too, are part of the natural.

If a combination of TB and brucellosis are too much for the infected population, then they will die, and $22 million will have been saved or spent elsewhere for good use.

If the homocentric aspects of this issue play an overpowering role in this assessment, then I urge you to consider this. What is at stake for farmers and for Natives, and how can they be compensated? To livestock operators, cattle represent economics. Should herds become infected, they can be replaced within a year, and monetary compensation can be provided in the meantime. At stake for Natives is more than just their livelihood. Their culture, their beliefs, their religion, the fabric of their lives revolves around Nature, of which the bison is a majestic and noble part. The absence of bison for 10 years can not be compensated in monetary terms, nor should it. In general, they don't care if the bison is hybrid or just how much disease is present? Bison depopulation is not in the general interests of Native groups, especially at a time when government funding for their newspapers and television has been recently cut. Canada does not need to deliver another dehumanizing, irrespectful blow to the First People.

I see the problem as one of priorities. What takes more priority, the content (and not the survival) of industry-related people or the fabric of Nature? Shall we try to understand bison and its interactions with disease, the land, and with us, or shall we try to steer these elements in the direction that we think they should go? I urge that the panel recommends to the Honorable Minister Lucien Bouchard that we treat the land and its creatures responsibly by allowing the bison and the disease to run their course for the time being. Effective interrim measures can be instituted until we understand more.

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SIERRA CLUB OF WESTERN CANADA BRIEF TO NORTHERN DISEASED BISON ENVIRONMENTAL ASSESSMENT PANEL

Submitted February 27 1990
by Rosemary Fox

SUMMARY

The American bison of Wood Buffalo National Park, the largest wild bison herd left from the millions that once roamed North America, are the descendants of the original indigenous wood bison and introduced plains bison. Thirty to fifty percent of the animals are said to be infected with tuberculosis and brucellosis. Agriculture Canada has proposed that they should be slaughtered to avoid infecting livestock in the vicinity of the park and to prevent contamination of the disease-free, "pure" wood bison of the Mackenzie Bison Sanctuary, which would be drawn upon to re-populate the park with healthy and pure stock of the original indigenous wood bison. If the slaughter is allowed to proceed, the largest and most diverse gene pool of American bison will be destroyed without any assurance that the present disease-free herd will escape infection, and a natural heritage of immeasurable intrinsic value lost. The Park's wilderness character and biological systems will be seriously impaired. The slaughter is likely to provoke a public outcry. The Sierra Club of Western Canada opposes the park bison extermination program, and advocates an ecosystem rather than single species approach to management, whereby the focus is on conserving the Park's ecosystem that sustains the bison rather than on the bison in isolation. Steps should be undertaken to restore important bison habitat in the Peace-Athabasca Delta impacted by the Bennett Dam, to monitor the prevalence of disease and wolf-bison relations, and to develop a vaccine and vaccination techniques that do not unduly stress the animals being treated. Ongoing efforts are also required to prevent contact between infected park bison and the disease-free Mackenzie Bison Sanctuary herd.

INTRODUCTION

The Sierra Club of Western Canada is a Chapter of the international Sierra Club, one of the largest , oldest and most respected conservation organizations in North America, founded in 1892 by the Scottish naturalist-philosopher John Muir. In Western Canada, we have taken an active part in many wildlife-related issues, and welcome the opportunity to make our views known on the complex issue of the brucellosis and tuberculosis-infected bison of Wood Buffalo National Park. The Club's position on Wood Buffalo National Park bison ultimately relates to the Club's goals and principles. In our submission we have drawn upon information contained in the briefs of the Canadian Nature Federation and Dr. Valerius Geist, who have researched the issue in considerable depth which we have not had the resources to do ourselves. We have also sought information in the Encyclopedia Britannica; the Canadian Encyclopedia; The Mammals of Canada, by Banfield 1974; An Analysis of the Decline of Bison in Wood Buffalo National Park from 1971 to 1981 and a Review of the Status to 1989, by L. N. Carbyn, D. Huisman, E. Street, D. Anions of the Canadian Park Service, 1989; and Descriptions of Wolf

Attacks on Bison Calves in Wood Buffalo National Park, by L. N. Carbyn and T. Trottier (in *Arctic*, Vol. 41 No.4 1988).

THE ISSUE

A third to a half of the Wood Buffalo National Park bison herd is said to be infected with either brucellosis or tuberculosis, or both of these diseases. Agriculture Canada has proposed that the entire WBNP bison herd be slaughtered and be replaced with animals from disease-free herds. Reasons for the proposed slaughter are:

1. Agriculture Canada is encouraging the cattle ranching industry to expand into areas adjacent to the Park. The Canadian cattle ranching industry is certified brucellosis-free, and is seeking to achieve tuberculosis-free status also. There is concern that contact between diseased bison and cattle may lead to the spread of brucellosis and tuberculosis from bison to cattle; and also about human safety.

2. The park bison are hybrids between wood bison and plains bison, and are likely before long to come into contact with the pure and disease-free wood bison herd of the Mackenzie Bison Sanctuary, which is expanding towards the park. The wood bison subspecies is therefore in danger of becoming contaminated genetically and infected with disease.

BACKGROUND

The American bison (*Bison bison*) once ranged over most of central North America from northern Mexico to Great Slave Lake and numbered 50-60 million. Most people associate bison in their minds with visual images of huge herds stampeding across the prairies pursued by hunters on horseback. By the end of the nineteenth century the plains (or prairie) bison was virtually extinct, except for a small herd of about twenty in Yellowstone National Park and some captive animals. Its close relative, the wood bison, found in the northwest region of the species' range, was also greatly reduced from the "very plentiful" numbers reported by Samuel Hearne in 1795. When the Canadian Parliament passed legislation in 1893 to protect remnant bison herds, about 500 wood bison were thought to occupy what is now Wood Buffalo National Park. To implement the legislation, the Canadian government acquired some plains bison and established a park for them at Wainwright, Alberta, and in 1922 it established the Wood Buffalo National Park (WBNP) to conserve the wood bison. A few years later, because of crowding at Wainwright Buffalo Park, plains bison were moved from there to WBNP. The new arrivals carried the bovine diseases brucellosis and tuberculosis.

Between 1929 and 1974 WBNP bison were slaughtered for meat (about 8,000 in all). In 1935 wolf control was initiated to provide more bison for human consumption, and continued until the 60's. Bison numbers increased to about 12,000 in 1934, and declined slowly over the next three decades to 9,500 in 1971. After that their numbers declined rapidly, and then stabilized or possibly declined gradually until 1988. They dropped again in 1989, and now stand between 4,000 and 5,000. It is noteworthy that their decline began after the cessation of wolf control and after completion of the Bennett Dam on the Peace, which altered the water regime in the Peace-Athabasca Delta that is utilized

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by 75% of the bison at some period of the year. Other factors thought to be relevant to the decline were severe winters in the early 70's, and ongoing roundups for anthrax vaccination that resulted in losses of many animals from trauma. Added to these stresses was some very severe flooding in the Peace-Athabasca Delta in 1974, which drowned possibly as many as 2,000 animals. The bison failed to recover from this final blow, and are now thought to be in a "predator pit" where numbers are kept depressed by wolf predation. These things are mentioned, to show that the bison "problem" is the result of a combination of factors, not just disease.

Meanwhile, in 1957 the Canadian Wildlife Service found a small population of what appeared to be pure wood bison in the Nyarling River area of Wood Buffalo National Park. Eighteen of these were taken to establish a population of pure wood bison at what is now the Mackenzie Bison Sanctuary to the north of WBNP, and another twenty-one animals were taken to Elk Island National Park. The MBS population has thrived and increased to around 2,000 animals, and has expanded its range south towards WBNP. On the other hand, WBNP bison not only are a hybrid population, but an estimated 30-50% are infected with brucellosis and/or tuberculosis and their numbers may be continuing to decline.

Interest in re-establishing wood bison as a pure subspecies in WBNP goes back over twenty years. In 1968 a proposal to fence and systematically destroy first the diseased and then the rest of the hybridized and plains bison, and replace them with pure wood bison stock was rejected, because of the likelihood of public opposition as well as for practical reasons. Recently an interjurisdictional Task Force, created to look for ways to deal with the problem of the diseased bison, came up with a set of options ranging from no action, to fencing, to elimination of the diseased bison. This was followed by the establishment of the Northern Diseased Bison Environmental Assessment Panel, reportedly at the request of the Minister of Agriculture, to look into the socio-economic, health and environmental problems associated with the WBNP bison. Subsequently Agriculture Canada, responding it seems to the interests of livestock ranchers, has presented its proposal to the Panel for the slaughter of the entire WBNP herd and its replacement with undiseased, pure wood bison. The debate over the bison is now focussed around Agriculture Canada's proposal.

DISCUSSION

The following questions need to be considered to reach a decision on this matter:

(i) is it worth slaughtering a whole population of wild animals to protect the interests of an industry wishing to establish itself in an area?

(ii) what is wrong with hybridization?

(iii) how serious is the disease problem, and what are the implications of proceeding, or not proceeding, with the proposed eradication program?

(iv) what other options are there?

Answers relate to the values held by those making them.

Sierra Club values

The Sierra Club's values are rooted in wilderness preservation. The Club was established in response to perceived threats to wild places in California in the late 19th century. Since then, the Sierra Club has been in the forefront of citizens' endeavours all over North America to preserve wilderness values - which include wildlife since wildlife is an integral part of wilderness. The Club's values are reflected in its slogan - to explore, enjoy and preserve our forests, waters, wildlife and wilderness. This does not mean that use comes first and preservation second, but that, through knowing about wild areas, either by being there personally or by books, films and art, we learn to appreciate them, and from this experience comes the desire to protect. Most of us probably will never have the opportunity to explore and enjoy Wood Buffalo National Park first hand, but we know about it, and we know that it contains our last _natural_ population of bison in the sense of continuously occupying its range for a long time, and being influenced by predators and other forces of true wilderness. WBNP is thus representative both of the wilderness that once was Canada and of a species that once roamed in millions across vast expanses of western Canada and helped shaped the history of our country. The bison, whether it be the prairie subspecies, _B. bison bison_, or the wood bison subspecies, _B.b.athabascae_, or a blend of the two (and the ordinary Canadian does not understand the subtle differences), is part of our natural heritage. As such, its value is immeasurable.

The questions

(i) _Is it worth slaughtering a whole population of wild animals to protect the interests of an industry wishing to establish itself in an area?_ A commodity increases in value as it becomes scarce. What we have left in Wood Buffalo National Park contains the largest remaining gene pool of the American bison, _Bison bison_, which the Canadian government committed itself to protecting in 1893. It is unique. The World Conservation Strategy, released in 1981, emphasized the necessity of maintaining genetic diversity, among other things, for the long term sustainability of the earth's living resources on which the future sustainability of human life depends. The cattle industry has no historic claim to the land adjacent to the park. The public is not dependent upon livestock ranching in this area for meat. On the other hand the public interest in wildlife is extremely high, as demonstrated by a number of national surveys in recent years. Furthermore, according to information presented to the review panel, there are no documented cases of local people, who have been eating the bison for decades, contracting brucellosis or tuberculosis from the meat. Also, there is no documented case of Yellowstone park bison, which are infected with brucellosis and roam outside park boundaries, infecting local cattle.

Consequently, we do not find Agriculture Canada's interest in opening up areas in the vicinity of WBNP to livestock ranching to be an accepable reason to exterminate the bison population of the National Park.

(ii) What is wrong with hybridization? Hybridization occurs frequently when two closely related subspecies come into contact. There are numerous instances of hybrid races, such as, for example the "Fannin" Stone's sheep/Dall's sheep hybrid which occurs in northern BC and the Yukon. No one has ever suggested that there is anything intrinsically "bad" about this or other naturally occurring hybrids in the wild so long as hybridization does not weaken the population's ability to survive. In any event, in fact there is apparently minimal genetic difference between the two subspecies, and some difference of opinion among scientists as to whether subdivision into subspecies is justified. Further, despite the addition of 6,000 plains bison to a population of 1,000 wood bison, the present population apparently has more characteristics of wood bison than plains bison. This can be explained by bison social behaviour which would have permitted the wood bison to have had a disproportionate genetic effect on the mixed population. There is further apparently a strong possibility that the "pure" wood bison that were salvaged from the park and placed in the Mackenzie Bison Sanctuary and Elk Island National Park are probably also hybrids, since there is evidence that they were in contact with the hybridized park population! Regardless of all this scientific debate over phenotypes and genotypes and ecotypes, the point is that what we have in Wood Buffalo Park is the largest remaining gene pool of the American bison, plains-type and wood-type. The Mackenzie Bison Sanctuary wood bison, while thriving and numbering around 2,000 from the original eighteen, has a very limited genetic heritage, particularly in view of what Dr. Valerius Geist has termed the "male dominance effect" whereby the dominant bull or bulls in a small founding colony prevent others from breeding and contributing their genes to the population.

(iii) How serious is the disease problem, and what are the implications of proceeding, or not proceeding, with the proposed extermination program? The presence of brucellosis and tuberculosis in the WBNP bison is certainly a matter for concern. It is an unfortunate situation, not only from the point of view of the health of the WBNP herd, but because of the proximity of the healthy, uninfected MBS herd. Measures currently being taken to prevent the contamination of the MBS herd (shooting of animals found in the no-bison zone) is preventing it from expanding to its full potential. On the other hand, a genetically limited population lacks the resilience of one that is genetically diverse. It therefore seems very risky to eliminate the largest and most diverse genetic reservoir of the American bison that has been living with tuberculosis and brucellosis for decades, in favour of a small, genetically limited herd, disease-free but lacking in immunity, especially in view of the recognized difficulties of totally eradicating brucellosis and tuberculosis. Because of the size of the area and nature of the terrain, it appears that some animals could easily escape the extermination program and survive to infect the reintroduced disease free animals that would have no immunity against brucellosis and tuberculosis.

The extermination program would likely to have far-reaching impacts on the park ecosystem. Removal of large numbers of herbivores would impact on vegetation. Wolves and other predators and scavengers can carry brucellosis and those in the Park are likely to be carriers. Would these species need to be disposed of as well? Removal of the bison would force the wolves to switch prey, and wolf control would probably be required to permit the new colony of bison to become established.

Might disease eventually kill off all the park bison? This is thought to be unlikely although that possibility exists. Given time, the bison should develop resistance to the diseases that now plague them and reach some kind of equilibrium. Carbyn et al. (1989) cite a 1987 PhD thesis by S. V. Tessaro of the University of Saskatoon (A descriptive and epizootiological study of brucellosis and tuberculosis in bison in northern Canada) to the effect that of 72 bison carcasses examined, 25% were infected with brucellosis and 21% with tuberculosis. They question why more bison are not infected, given that they are herd animals in close contact with one another. The Yellowstone bison are infected with brucellosis and have apparently adjusted to it. The WBNP bison are currently preyed upon heavily by wolves, in spite of the fact, as reported by Banfield, that it is difficult for wolves to bring down an adult bison, and not all that easy to kill calves either according to Carbyn and Trottier. They are likely, therefore, to be taking the least fit animals. One view is that the present heavy wolf predation that is currently keeping the WBNP bison in a "predator pit" may be to the eventual advantage of the bison by eliminating the weaker diseased animals and possibly even eventually eradicating the diseases. There is no doubt a great deal of uncertainty about the outcome both of taking direct action and of letting nature take its course. Scientists still have an inadequate knowledge of complex biological systems to know conclusively how they function and how to tinker with them.

(iv) What other options are there? Obviously, the alternative to killing is to let live. Measures can, however, be taken to improve the fitness of the WBNP bison herd, such as habitat restoration and the development of a vaccine with which to innoculate the bison without having to capture them, which, experience has shown, is too traumatic. (A vaccine is currently being developed and tested for elk which is administered in the form of pellets and injected by means of an airgun.) To prevent contact with livestock and disease-free bison, livestock can be fenced in and a livestock free zone created around the park; and the present bison-free zone between the park and the Mackenzie Bison Sanctuary maintained to keep the two bison populations apart. We do not find the option of fencing the park acceptable, as park boundaries do not coincide with those of its biological systems. The park would become insulated from the surrounding country and its biological systems would likely deteriorate as a result. Furthermore, in the public mind fencing would destroy the wilderness nature of the park and turn it into an open air zoo.

CONCLUSION

To sum up, the Sierra Club of Western Canada strongly opposes the proposed bison extermination program for the following reasons.

- To slaughter the bison to serve the interests of the livestock industry is, in our view, to abandon the commitment made by Canada a century ago to protect its remaining bison, to render futile all the efforts made to do so despite the misguided nature of some of these, and to destroy a feature of our natural heritage of important conservation significance and immense intrinsic value.

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- We believe the principle underlying the management of large wilderness parks must be the maintenance with minimal interference of naturally evolving ecosystems. This is National Parks policy. It means in practice preventing actions that will disrupt natural processes. Wood Buffalo National Park must not be exempted from this principle. If it is, not only will the wilderness values of Wood Buffalo National Park be lost, but the precedent set will lead to the incremental destruction of Canada's wilderness and wildlife heritage now protected in other National Parks, and future generations of Canadians will be greatly impoverished.

- In our view, the argument relating to protecting the integrity of a subspecies does not hold any water in this case, since there is some disagreement in the scientific community as to whether the differences between wood bison and prairie bison are in fact sufficient to warrant subdivision of the species Bison bison into subspecies. As we see it, what is at stake is the continued existence of the largest, most diverse gene pool of the American bison species, as opposed to an impoverished gene pool limited to a subspecies which may not be a subspecies. Consequently, we do not find it acceptable to place a higher value on the Mackenzie Bison Sanctuary herd than the WBNP herd, even though the WBNP bison population is infected with disease.

- The presence of disease, which may be making the bison more susceptible to other forms of stress such as extreme weather conditions, habitat degradation and predation, is a matter of considerable concern. However, we think the extermination solution is both too radical and too risky. We find the risks of far-reaching ecological impacts unacceptable. Furthermore, if extermination is incomplete and some animals survive the slaughter, in bison conservation terms the situation would be worse than before because the reintroduced disease-free bison would have no immunity. It seems to us unreasonable to run these risks when there is a possibility that the bison will develop resistance to the diseases and may already be doing so.

- Dr. Geist, a wellknown and respected wildlife biologist, anticipates that heavy wolf predation, such as is now occurring, will lead to a decline, and even extinction, of the two bovine diseases affecting WBNP bison. This, we believe, is an added reason not to exterminate the bison population. Furthermore, it surely has important management implications. It seems to us that it would be in the best interest of wildlife managers to allow the wolf-bison-disease interactions to evolve towards a natural equilibrium, in order to gain a better understanding of long-term wolf-bison relations which in turn will provide a more knowledgeable basis for management of these species and the biological systems of which they are a part. To destroy the bison herd without knowing what will happen if nature takes its course will not advance much needed knowledge of predator-prey relations.

- A more positive approach than the one promoted by Agriculture Canada would be to strengthen the capability of bison to withstand disease and other forms of stress by restoring degraded habitat and undertaking research to develop a vaccine that can be administered without the trauma of capture, while permitting natural selection processes to continue. This is an ecosystem approach, rather than the species-

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specific approach of herd elimination, and one which we believe accords with modern scientific views that management must be directed towards ecosystem conservation rather than single species. Such an approach means that the biological systems represented by the park should be allowed to evolve naturally, even if this means a lower density of animals than in theory might be attainable with manipulative management. It also means that there must be a commitment on the part of the federal, provincial and territorial governments involved not to take actions outside the park's boundaries which will impact adversely upon the park's biological systems.

- There is also the question of ethics. Ethics relate to values, not science. As already stated, the Sierra Club places a high value on wilderness. Beyond that there is a broader question of what is the morally "right" thing to do? Attitudes have changed. The Encyclopedia Britannica tells us that "with the westward movement of white civilization it (the bison) was wantonly slaughtered - for meat, hides, sport, and sometimes only for the tongue". Who today would regard that as right? Now Agriculture Canada wants to slaughter the largest remaining herd of American bison in existence, to serve industrial interests. Is that right? We do not think so, and we doubt that the world that was repelled by the seal hunt will either.

RECOMMENDATIONS

Based on the foregoing, therefore, the Sierra Club of Western Canada makes the following recommendations:

1. That no slaughter of park bison take place.

2. That the park should be maintained as a wilderness ecosystem, and its natural biological systems be allowed to evolve with management intervention directed solely to restoring ecosystem integrity to the extent possible. To this end,

   (i) studies should be carried out to identify the steps that are needed to restore habitat in the Peace-Athabasca Delta and prevent further deterioration caused by alteration of the water regime by the Bennett Dam on the Peace;

   (ii) funding should be allocated as a matter of urgency to develop a suitable vaccine that can be used to innoculate the bison without prior capture;

   (iii) ongoing monitoring of the prevalence of disease among the WBNP bison and of wolf-bison relationships should be undertaken.

3. That WBNP management should not terminate abruptly at the park's boundaries but relate to ecosystem boundaries; and a system of zoning should be established to ensure that human activities outside the National Park do not impair park values.

4. That every effort be made to prevent contact between the park bison and Mackenzie Bison Sanctuary bison until such time as disease contamination no longer poses a threat.

British Columbia
Veterinary Medical Association

February 21, 1990

Mr. Paul Scott
Executive Secretary
Northern Diseased Bison
Environmental Assessment Panel
510-750 Cambie Street
Vancouver, B.C.
V6B 2P2

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FEB 27 1990
FEARO PACIFIC

Dear Mr. Scott,

The following is the position adopted by the Council of the British Columbia Veterinary Medical Association on the issue of diseased Bison of Wood Buffalo National Park. We will not attempt to address all of the important socio-economic considerations which fall outside the scope of Veterinary Medicine. For the purposes of the British Columbia Veterinary Medical Association the following factors are considered:

1) The hybrid population of Wood Bison National Park is infected with Bovine Tuberculosis(TB) and Bovine Brucellosis. The herd is decreasing in number and is projected to be extinct within 25 years.

2) The pure wood bison population of the Mackenzie Bison Sanctuary (MBS) is free of TB and brucellosis. It is expanding, and as the population continues to increase, the risk of contamination grows. Once this herd becomes infected with either disease, support to preserve and enhance wood bison will disappear.

3) Neither Bovine TB nor Bovine Brucellosis are native to North America. They are exotic diseases brought in with the importation of European cattle. Since North American bison did not evolve in the presence of these diseases their population are unable to survive in the presence of either TB or brucellosis. Thus the problem facing these animals is man-made.

.../2

Suite 155, 1200 West 73rd Avenue, Vancouver, B.C., Canada V6P 6G5 • Tel: (604) 266-3441 Fax: (604) 266-8447

4) Neither TB nor brucellosis can be eliminated from a wild population once it has become infected. Both diseases can remain viable in carrier animals for years. These animals can survive and spread the infections without showing any outward signs of illness because of the inability to detect carrier animals in the wild it is impossible to selectively cull infected individuals. No vaccine exists for TB and it would be impossible to establish a successful vaccination program for brucellosis. There is no effective treatment for either disease.

5) If the MBS herd becomes infected both diseases will spread and the same pattern of decline and local extinction will befall the wood bison.

6) Properly conducted eradication programs for both brucellosos and TB (in areas with no reservoir hosts) have been extremely successful in eliminating these diseases from cattle populations throughout Canada. So successful in fact, that the Wood Bison National Park is considered to be the last major reservoir of these diseases in the country. Unfortunately, herd eradication is the only course of action which is likely to ensure control of both infections.

7) A bison ranch is planned by the natives of Fort Smith in an area of the Slave River Lowlands. This area is utilized by the hybrid bison. The potential for diseased bison to "inadvertently" end up within the confines of the ranch, by fair means or foul, certainly exists. These animals would then be subject to sale and transport to other bison ranches throughout Canada, with dthe resultant potential of causing massive economic losses elsewhere in the country.

8) Cattle ranching occurs up to the border of WBNP and is increasing. The presence of the infected WBNP herd remains a constant threat to the cattle, and to the livestock industry of Alberta. If one or more cattle, and ranches become infected export sales of cattle semen from Canada will suffer. The costs of preventing the spread of TB and brucellosis in Northern Alberta will escalate from the current annual budget of $500.00 to several millions of dollars per year.

That is, they can be transmitted from animals to man. In man they can have serious, sometimes fatal, consequences.

10) The plight of the hybrid bison of WBNP has been reviewed by the Wildlife Disease Association. A summary of their position was that "effective control of brucellosis and tuberculosis is in the best long term interests of wildlife conservation " and that" the Wildlife Disease Association supports the elimination of the brucellosis and/or tuberulosis infected hybrid populations associated with WBNP and subsequent replacement with disease-free, genetically pure wood bison from the other areas."

Recommendations:

a) As soon as possible, completely and humanely eradicate the entire bison population of Wood Buffalo National Park.

b) After depopulation, leave the park fallow for at least one year. Then permit animals from the MacKenzie Bison Sanctuary to migrate southward into WBNP at their own pace.

c) Actively re-introduce disease-free wood bison after 2-3 years.

d) Decrease cattle ranching around the Wood Bison National Park border.

e) Do not permit the ranching of bison within 100 km of either the MBS or Wood Bison National Park for at least 5 years.

Sincerely,

C. Byra, D.V.M.
President

ST/BISON
00213004

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MANITOBA NATURALISTS SOCIETY

Room 302-128 James Avenue, Winnipeg, Man. R3B 0N8 Phone 943-9029

February 27th, 1990

RECEIVED

FEB 28 1990

FEARO PACIFIC

Colin LaChance,
Executive Secretary,
Northern Diseased Bison Environmental Assessment Panel,
510-750 Candie Street,
Vancouver, B.C.
V6B 2P2

Dear Mr. LaChance:

The Manitoba Naturalists Society is a volunteer organization composed of Manitobans who share a special interest in, and concern for, the natural environment. As naturalists, and as Canadians, we are concerned about the future of the bison in Wood Buffalo National Park (WBNP) and wish to make our concerns known to your panel.

The issues relating to the WBNP bison herd are complex. However, there are several important principles which must not be forgotten when seeking solutions to the bison disease problem. We have had an opportunity to study the brief submitted to your committee by the Canadian Nature Federation (CNF), and we endorse the positions taken and the recommendations made in the CNF presentation.

In particular, we emphasize the irreplaceable value of the genetic diversity contained within the current bison population of Wood Buffalo National Park. Considering the limited gene pool of the Mackenzie Bison Sanctuary (MBS) herd, and of other herds outside of Wood Buffalo National Park, it is critical to preserve the genetic diversity of the WBNP herd, if at all possible.

While it is possible that tuberculosis and brucellosis may eventually eliminate the existing bison herd in Wood Buffalo National Park, there is no clear evidence that this will happen. Natural populations characteristically undergo large fluctuations, and much of the population decline in the WBNP bison herd over recent years can be attirbuted to factors other than disease. With the possible development of vaccines for treating the diseases in bison, it is probable, given time, that the WBNP bison herd can recover and that their precious genetic material can be preserved.

Maintenance of the genetic integrity of the wood bison herd in the Mackenzie Sanctuary is desirable. It is also vitally important that these disease-free animals be protected from tuberculosis and brucellosis. However, these goals should be achieved through aggressive maintenance of a bison-free buffer zone between WBNP and the MBS. Protection of the small gene pool of the MBS herd through elimination of the much larger gene pool represented by the WBNP herd makes no sense.

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The problem of disease transfer to cattle on ranches near the park is a serious concern However, onus must be placed on the cattle ranchers, and on the local governments, to keep cattle free of the bison range and to protect the cattle by vaccination. Again, an aggressively maintained buffer zone, free of both cattle and bison, must be maintained between WBNP and the ranches to the south. Wood Buffalo National Park was established as a wilderness preserve for the protection of these magnificent animals. It rightfully has been recognized as a World Heritage Site The natural state of WBNP is already threatened by dams and pulp mills located upstream of the park Its integrity must not be compromised further by the incursion of domestic animals.

Finally, we recommend against heavy-handed management schemes within the confines of a National Park. The current problems are the product of such management decisions. National Parks are one of the few places in which natural ecosystems can be protected Although it might be argued that the current bison diseases are not natural, the bison are an integral component of the WBNP ecosystem. Removal of this component, even temporarily, would have devastating effects on the food chain, and no one can predict the outcome for the WBNP ecosystem. Even if non-diseased bison were eventually reintroduced, there are no guarantees that the diseases would not reappear from some unknown source.

In summary, the Manitoba Naturalists Society recommends that no slaughter of bison take place within Wood Buffalo National Park. Contact between diseased bison and either cattle or non-diseased bison should be prevented by the active maintenance of buffer zones around the Park. Concerted efforts must be made by ranchers and by local governments to vaccinate cattle against the diseases and to keep them in fenced enclosures. Every effort must be made to develop a vaccine suitable for use on bison in the wild. The existing bison of Wood Buffalo National Park are indeed a "world heritage" Eradication of this herd would result in an irreversible loss of this heritage. Such action is not warranted at this time.

Sincerely,

R.G. Tester.

ROD G. TESTER
President

CONSTRUCTION AND GENERAL WORKERS UNION
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SUBMISSION BY: JIM ROGERS ON BEHALF OF THE FT.McMURRAY LOCAL OF THE ALBERTA TRAPPERS ASSN.

TO: THE TASKFORCE ON DISEASED BISON OF WOOD BUFFALO PARK

ATTENTION: COLIN D. LACHANCE

MR. CHAIRMAN

WHILE ATTENDING THE HEARING IN EDMONTON, I WAS SHOCKED AND ASTONISHED THAT WOOD BUFFALO PARK APPEARS TO BE RUN IN THE IRON GRIP OF A WHITE COLONIAL BUREAUCRACY, AND THAT NATIVE PEOPLE ARE NOT DEEMED CAPABLE OR WORTHY OF MANAGING THEIR OWN RESOURCES.

I AM SAD TO SEE SCIENTISTS AND PROFESSIONALS DIVIDED INTO TWO GROUPS:

1. THOSE WHO ARE INDEPENDENT, AND CAN SUFFER THE WRATH OF THE PARK MANAGEMENT AND GOVERNMENT AND ABLE TO SPEAK AGAINST THE SINGLE MINDED ADVOCACY OF THE BIG BUFFALO HUNT (SLAUGHTER) AS RECOMMENDED BY PARKS CANADA.
2. THOSE WHO ARE EMPLOYEES OF, OR ARE BEHOLDING TO, THE GOVERNMENT OR PARK AUTHORITY, OR MAY NEED TO BE EMPLOYED BY OR OPERATE IN THE GOOD GRACES OF, ONE OF THESE AGENCIES IN THE FUTURE (TO HEAR NO DESCENTING OPINION FROM THE APPEARANTLY DISINTERESTED GOVERNMENT WITNESSES IS UNACCEPTABLE).

I CAN NOT ACCEPT THE POSITION OF THE GOVERNMENT AGENCIES AND DEPARTMENTS AND BELIEVE THAT THEY HAVE COMPROMISED THEIR OBJECTIVITY. I DO NOT HAVE ANY CONFIDENCE IN THEIR DATA, OPINION, OR ASSUMPTIONS ABOUT MANAGEMENT OPTIONS OR COSTS IN THIS MATTER.

i.e. I HAVE DONE A QUICK PHONE SURVEY OF TRAPPERS IN THE FT. McMURRAY AREA AND REPORT THAT:

-TWO SMALL HERDS ARE REPORTED IN THIS AREA, ONE ON THE EAST SIDE OF THE ATHABASKA RIVER AT THE LATITUDE OF EMBRASSE PORTAGE FIVE TO SEVEN YEARS AGO, AND A FEW RUMORED IN THE BIRCH MOUNTAINS.

-TWO DECOMPOSED SKULLS WERE FOUND; ONE NORTH OF MOUNTAIN RAPIDS (ROGERS AND CARDINAL 1968), ONE IN THE CLEARWATER RIVER VALLEY (TOM LOCKRINE 1950).

-I HAVE NO OTHER WORD OR REPORT OF SIGHTINGS, TRACKS, OR REMAINS IN THE MEMORY OF MY INFORMANTS WITH 70 TO 90 YEARS IN THE AREA.

I MUST CONCLUDE THAT THE PARK MANAGER IN REPORTING TO THE PANEL THAT BISON FROM THE PARK HAVE WANDERED AS FAR SOUTH AS COLD LAKE,HAS COMPROMISED HIS INTEGRITY IN ADVOCATING HIS BIAS.

I WOULD RECOMMEND:

-THAT INDEPENDENT STUDIES BE COMMISSIONED TO ACERTAIN THE TRUE STATUS OF THE BISON POPULATION (I FEAR THAT THE PARK AUTHORITY CULLS THE HEALTHIEST BULLS AND PERFORMS HEALTH SURVEYS ON THE OBVIOUSLY SICK).

-THAT WITHIN FIVE YEARS THE WHOLE MANAGEMENT OF THE PARK SHOULD BE TURNED OVER TO LOCAL AND NATIVE PEOPLE WHO WOULD BE EMPLOYEES OF THE NATIONAL PARKS DEPARTMENT, AND WOULD BRING IN EXPERTEES AS REQUIRED.

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Page 2 of 2

-THAT THE S.P.C.A. SHOULD BE ASKED TO EXAMINE THE PRESENT PARK MANAGEMENT TEAM AND THEIR PAST MANAGEMENT RECORD.

-THAT ANY BISON DISCOUVERED AT A DISTANCE FROM AND OUTSIDE THE PARK SHOULD BE ASSUMED TO BE A WILD POPULATION

-THAT THE WOOD BISON SHOULD BE RECOGNISED AS A RESOURCE IN DISTRESS WHICH REQUIRES SENSITIVE MANAGEMENT AND ONGOING MEDICAL ATTENTION, WHICH MAY REQUIRE SELECTIVE HARVESTING AND QUARENTINE AREAS.

-THAT NO BISON SHOULD EVER AGAIN BE KILLED AT THE DISCRETION OF NON-NATIVES, OR SLAUGHTERED BY WHITE HUNTING PARTIES ON ORDERS FROM THE WHITE PARK AUTHORITY.

-THAT A MANAGEMENT GROUP, OF REAL AND HISTORICAL STAKE HOLDERS BE STRUCK TO DISCOUVER AND IMPLEMENT AN ONGOING TREATMENT AND SALVAGE STRATEGY WHICH COULD; SELL PERMITS AS A MEANS OF HARVESTING (CULLING) SICK ANIMALS, PROCESS OR SELL MEAT, INVOLVE NON-PROFESSIONALS AND RUN MONITORING PROGAMMES AT THEIR DISCRESSION IN AN ATTEMPT TO ELIMINATE DISEASE IN THE BISON POPULATION.

-THAT NO FURTHER ENCROACHMENT OF AGRICULTURAL RANCHING OF DOMESTIC OR WILD ANIMALS BE ALLOWED ON THE TRADITIONAL RANGE OF THE WOOD BISON.

CANADIAN PARKS AND WILDERNESS SOCIETY
Edmonton Chapter

Colin Lachance
Executive Secretary
Northern Diseased Bison
Environmental Assessment Panel
510 - 750 Cambie Street
Vancouver, B.C.

RECEIVED
MAR 1 - 1990
FEARO PACIFIC

February 28, 1990

Dear Sir:

The controversy surrounding the bison population in Wood Buffalo National Park has pitted biologist against biologist, and, to an extent, national park management against wildlife and agricultural management.

Thus, the Edmonton Chapter of CPAWS, most of whose board members have but lay experience with the matters at hand, enters the fray with hesitancy, but also with heartfelt concern.

Undoubtedly, the recommendation made by the panel and the decision taken by the minister will be dramatic in impact, especially if it is the option to eradicate the herd. We would not like to see either the CWS or the CPS, upon whom the public will lay blame if the extermination option is taken, suffer by being dragged through years of negative newsmedia attention. We deeply respect the staff of both agencies and would like to position ourselves in such a way as to be able to be supportive of the decision that is taken.

Given our concerns, we have elected to submit a brief to the panel with a single goal in mind, namely, to contribute to and expand upon the range of fact, opinion and speculation on the issues.

To operationalize this goal, we desired to submit an independent perspective that may be different than other perspectives. Thus, we asked Dr. Luigi Morgantini, who had not, himself, taken a position on the issue, to assess the Task Force Report and, based on his experience and expertise as a wildlife biologist, to prepare a brief.

GROAT ROAD BUILDING, 11759 - GROAT ROAD, EDMONTON, ALBERTA, CANADA T5M 3K6

Having examined Dr. Morgantini's brief, we are inclined to recommend against the extermination option and to recommend for option # 9 (confinement strategies). However, we admit that our lay backgrounds do not permit us to take this position with a great deal of certainty.

Given that many of the professional and research biologists with whom we have spoken have indicated a similar uncertainty, we do feel that a conservative approach as recommended by Dr. Morgantini is clearly warranted at this time.

Sincerely,

Dr. R.V. Rasmussen, Chair

NORTHERN DISEASED BISON: ISSUES, QUESTIONS AND CONCERNS.
A rebuttal of the proposed elimination of bison from Wood Buffalo National Park.

Luigi E. Morgantini, Ph.D.
Wildlife Biologist, Edmonton, Alberta. 403-963-3849
Adjunct Professor Wildlife Habitat Management
Department of Forest Science
University of Alberta, Edmonton, Alberta.

The controversy surrounding the bison population in Wood Buffalo National Park (WBNP) centers around the presence of tuberculosis and brucellosis in bison, and it is based on two concerns: the "risk" of transmission of brucellosis and tuberculosis from bison to livestock outside the National Park; and the "risk" of having these diseases transmitted to the bison population in the Mackenzie Sanctuary. The solution, as proposed by Agriculture Canada and supported by some wildlife biologists, is the removal of the bison population of Wood Buffalo National Park. This "removal", euphemism for extermination, is rationalized, in part, by the belief that the bison population in WBNP is made up of hybrids of two subspecies, plains (subspp. *bison*) and wood (subspp. *athabascae*) bison. The implications are that a hybrid, and furthermore, a diseased, hybrid population can be easily disposed of as non-important.

It is not my objective to review and address the scientific and technical aspects of the controversy. These have already been exhaustively covered by numerous documents and submissions to the Environmental Assessment Review Panel. Rather, my intent is to examine the tripartite rationale of Agriculture Canada's proposal. Specifically, I perceive the presence of brucellosis and tuberculosis in WBNP, the presence of "hybrids" in WBNP, and the health of bison in the Mackenzie Bison Sanctuary as separate issues. I believe that, in the heat of the debate, the significance of each individual issue has been lost. These issues are being obscured by debate and controversy over details. Further, groups and agencies with specific mandates, have used other agencies concerns to support their own. Interestingly enough, we heard Agriculture Canada expressing concerns about the fate of wood bison in the Mackenzie Bison Sanctuary and the welfare of wildlife populations, while Government Wildlife Agencies, are concerned about the brucellosis-free status of Canada's livestock..

The main aim of this submission is to show that when issues and concerns are assessed on their own individual merit they do not warrant the radical solution proposed by Agriculture Canada.

THE "PLAINS BISON"-"WOOD BISON" HYBRIDIZATION ISSUE

This subject has been discussed at length by various wildlife scientists. Dr. Valerious Geist, of the University of Calgary, has submitted to the Environmental Assessment Review Panel an extensive document arguing about the extent of genetic differences between wood bison (*Bison bison athabascae*) and plains bison (*Bison bison bison*). Whether there is a significant genetic distinction between the two subspecies or not, it seems clear from that document, and from a quick review of the scientific literature, that on the subject there is significant disagreement between wildlife scientists.

Scientists in the biological field tend to forget that in many cases they express opinions and not certainties. Considering such disagreement in opinions, is it acceptable to discount the WBNP bison population as a genetically "inferior" one and hence worth removing and replacing with a genetically "better" one? I believe such is not the case. If the bison population in WBNP were not carrying brucellosis and tuberculosis, very few biologists would think of slaughtering it on the reason that it is a "hybrid" population. No one has yet proposed slaughtering the wapiti (elk) (*Cervus elaphus*) population of Banff National Park. Nonetheless, it is unquestionably a mixture of two different subspecies (*manitobensis* and *nelsoni*)[1]. Similarly, during the last decade, mixed origin[2] wapiti stocks from Elk Island National Park have been used to restock wapiti throughout the Province of Alberta, whereby they are mixed with local herds of the "pure" subspecies *nelsoni*. Are we to propose the removal of all wild wapiti in Alberta on the basis that they are not a "pure" subspecies?

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[1] In the early 1900's, when Rocky Mountain wapiti from Yellowstone National Park (subspp. *nelsoni*) were reintroduced in Banff, at least 32 Manitoba wapiti (subspp. *manitobensis*) were present (Holroyd and Van Tighen 1983).

[2] The wapiti population of Elk Island National Park originated from some 24-31 animals which belonged either to the Manitoba subspecies or, at best, had genetic affinities with both the Rocky Mountain wapiti to the west and the Manitoba wapiti to the east (Blyth and Hudson 1987).

Along the eastern slopes of the Rocky Mountains in Alberta, mule deer (*Odocoileus hemionus*) and white-tailed deer (*Odocoileus virginianus*), two different species, hybridize. Should the wildlife profession endorse "clean-up" operations? And there are many other hybrid wildlife populations in North America.

My point here is that the "hybrid" issue is a false issue, raised to support Agriculture Canada bison removal program. Whether the bison population in WBNP is a hybrid population or not is of academic and scientific interest, but it is not a wildlife management concern. I question the ethical and moral grounds of eliminating the WBNP bison population on the argument that it is an hybrid population and hence of limited value.

THE WOOD BISON MACKENZIE SANCTUARY:
thoughts about disease-free wildlife populations

Why are some bureaucrats and some wildlife biologists so very concerned about having a "healthy" (i.e. disease free) Wood Bison population in the Mackenzie Bison Sanctuary? Free ranging wildlife populations are not disease-free. Some may have major tick problems which, coupled with severe winters, can substantially reduce population sizes. Others carry major parasites which can kill either the host or other species sharing the same range. Furthermore, some of these diseases and parasites are a serious human health hazard. However, no one has seriously considered the removal of these populations. In essence, wildlife populations cannot be sanitized; disease, predation and parasitism are the norms by which populations are regulated. Sixty years of experience has unequivocally demonstrated there is not a serious risk of zoonotic transmission. Local people are not at risk. In densely populated southern regions, we monitor and kill to control rabies. Despite serious transmission risks, wholesale slaughter is not advocated. So, why are wildlife biologists concerned now about the spreading of brucellosis and tuberculosis to the Mackenzie Sanctuary bison? This population is increasing exponentially. Clearly, if management does not control its growth and expansion, environmental degradation and/or disease will. So, what is so special about having the Mackenzie Bison Sanctuary population disease free? We do not live in a perfect world. We have substantially changed the environment we inhabit; the intricate web of animal-environment interactions has been affected by our activities, and because of our activities we now have wildlife populations that have diseases which otherwise would not be present. Brucellosis and tuberculosis can indeed be debilitating for the animals and can cause significant direct or indirect mortality in a population. But there is no evidence to suggest that these diseases will lead to the extinction of the population (Bison Disease Task Force: Evaluation of Brucellosis and Tuberculosis in Bison in Northern Canada).

I acknowledge the efforts spent in the Wood Bison Recovery Program. I am not arguing against reasonable attempts to keep the Mackenzie Sanctuary population "healthy". However, I strongly believe that the removal of the WBNP bison population to "protect" the Mackenzie Sanctuary bison population is a radical and totally unjustifiable course of action.

In conclusion, it is unfortunate that the bison population in WBNP is infected with brucellosis and tuberculosis. We should try to keep these diseases away from the Mackenzie Sanctuary bison population, but not through the removal of the WBNP bison population. The environmental and biological, short and long term impacts of such a shotgun approach are unknown, or, at best, pure speculation.

THE BRUCELLOSIS-TUBERCULOSIS ISSUE

Protection of agricultural interests, through the eradication of brucellosis and tuberculosis from Northern Alberta, seems to be the only reason which could theoretically justify the removal of bison from WBNP. But, we must ask whether this is an acceptable approach. I believe that massive intervention within a National Park and a World Heritage Site, just to protect agricultural interests is totally unacceptable.

Furthermore, the case in support of bison removal from WBNP is far from being without flaws.

This submission does not aim to be an exhaustive critique of Agriculture Canada's position. Also, it is not my objective to critically review the Bison Disease Task Force report. However, the following points demand a critical assessment:

1. The Bison Disease Task Force has dealt quite extensively with the issue of brucellosis from bison to cattle (pp. 4-52 4-58). Yet, the report gives the impression of downplaying studies and official statements which indicate that transmission in free-ranging population is unlikely. The report is quick in dismissing the following statement by the U.S Department of Interior (1985; p. 4-54 Bison Disease Task Force):

> *"Present information indicates that transmission of the Brucella organism between free-ranging bison and domestic cattle is a theoretical possibility rather than a biological problem...".*

The report also downplays the Mccorquodale and DiGiacomo (1985) study which underlines how the presence of wild ungulates has not hindered the "eradication" of brucellosis in livestock in any part of the world. It is interesting here to note that Canada has achieved the bovine brucellosis free status in spite of the presence of brucellosis in the bison population in WBNP. However, the Bison Disease Task Force Report report does emphasize experimental studies where cattle developed brucellosis when housed with infected bison. Nonetheless, the report, in describing Option # 9 (Confining Diseases to WBNP), states that the option *"would provide time for required research into bison movements and disease transmission"* (!).

Regardless of where the Bison Disease Task Force Report stands on the bison-cattle transmission issue, it is clear that the risk of transmission either is not as high as Agriculture Canada wants the public to believe, or is not known.

2. The Bison Disease Task Force, in summarizing the various options available, recognized in the information gaps section of the bison removal program the need to determine *"the significance of other species, such as wolves and moose, as vectors of brucellosis"* (p. 5-21). This statement, and the previous one on disease transmission, supports my fear that the

presence of brucellosis in other wildlife species as well as its potential for transmission between cattle, bison and other wildlife species is still far from clear. Again, it seems that scientists tend to present certainties when all they have is opinions based on very limited evidence. In view of such a lack of understanding, I ask whether the environmental, biological, political, social and financial cost of removing the bison population from WBNP for the interest of the livestock industry is warranted.

3. The issue of periodic out-breaks of brucellosis in cattle is not dealt with to any significant extent by the Bison Disease Task Force. As stated by Dr. Geist, Canada's cattle are "relatively and not absolutely free of brucellosis". As long as wildlife populations free-range in northern Alberta, there is the potential for some animal to be infected by cattle through various means (grazing on infected pastures, etc.). Could not this animal transmit brucellosis back to the bison population in WBNP, which, if Agriculture Canada has its way, would be then represented by "pure", disease free, wood bison? Millions of dollars later, and after a significant social and environmental cost, the livestock industry would have to face again the issue of a brucellosis reservoir in northern bison. This scenario is likely. As previously stated, transmission from free-ranging bison to cattle, and vice versa, as well the importance and value of other wildlife species as vectors, is still little understood.

4. Alberta Agriculture officials have stated that, in the livestock industry, the fear of transmission of brucellosis and tuberculosis from wild ungulates to cattle is as important as the actual risk for the transmission to occur. That being the case, the drastic eradication of WBNP bison will make only a marginal difference. It is well known that wapiti are an important reservoir of brucellosis. While attention is given to the Yellowstone National Park wapiti herd (50% infection rates), it must be noted that in non-concentrated wapiti herds in Montana the infection rate is estimated at about 1% (p 4-42, Bison Disease Task Force). That rate is quite low, but it indicates that the disease is present. Further, since the livestock industry deals with fear and perception, the actual infection rate does not really matter.

In southern Alberta, a Montana wapiti herd ranges across the International boundary between Waterton National Park and Glacier National Park. This herd intermingles with other herds that range year round on prime agricultural land. A survey in the region surrounding Waterton National Park (Kingscote *et al*. 1987) failed to detect the presence of brucellosis. However, it is theoretically possible that a similar rate of infection is present in wapiti in Alberta[3]. With the exception of Kingscote's study, I am not aware of any recent systematic study on the presence of brucellosis in free-ranging wapiti in Alberta. I acknowledge the fact that wapiti in Elk Island National Park are apparently brucellosis-free (Blyth and Hudson 1987). However, brucellosis in Elk Island National Park was eradicated through an intensive population reduction program, that, while not aimed at disease control, achieved the same ultimate result. The wapiti population is kept within a fenced environment, where it is unlikely to interact with livestock or other potentially infected wildlife species. Further, the population is intensively managed and its disease status cannot be considered representative of free-ranging wapiti populations in Alberta.

Still with regard to brucellosis, wapiti, and cattle, it is here interesting to note that in 1977, a rancher in south-western Alberta (Mr. Ron Conrad) had an outbreak of brucellosis in his cattle herd. Immediately, concerns were raised about the presence of brucellosis in wapiti. In spring 1978, the Alberta Fish and Wildlife Division was required to kill some wapiti. Fortunately, no positive reactors were found, and no precedent existed for slaughtering a species and violating the integrity of a National Park. Another case of outbreak of brucellosis in cattle in the same region occurred in the Mane's family operation a few years earlier.

It could be argued that those incidents occurred before Canada was declared brucellosis-free. But, outbreaks of brucellosis in cattle still occur!

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[3] This is not pure speculation. Only 4-5 years ago the presence of the giant liver fluke (*Fascioloides magna*) in wapiti in Alberta was a non-issue for wildlife biologists and managers. Now the wildlife profession is deeply concerned about that parasite and its potential impact on wapiti and moose. But this is only due to the persistence of one, at the time not very popular, biologist (Margo Pybus) who single-handedly convinced reluctant authorities to assess the occurrence and distribution of the parasite. Incidentally, giant liver flukes are also dangerous to domestic livestock.

The southern Alberta wapiti herd in question, some 300-500 animals, share the same ranching environment of cattle and frequently intermingles with them. It also intermingles with some 600-800 wapiti further west. It is possible that a single individual wapiti may cause an outbreak of brucellosis in range cattle. But it is also conceivable that otherwise healthy wapiti could be infected by an outbreak of brucellosis in range cattle through grazing on infected pastures. This could happen not only in south-western Alberta, but everywhere else in the Province.

In view of the stand that Agriculture Canada is taking with regard of the WBNP bison population, the implications of having a single individual wapiti tested brucellosis positive are mind boggling. We can picture the uproar of the local livestock industry. Will Agriculture Canada propose to capture and vaccinate all the wapiti in southern Alberta, or should we eventually try to exterminate them?

In addition to concerns about the livestock industry, the potential for wapiti ranching and the fact that some populations are "hybrids", would further support any proposal to eradicate the wild populations.

Please note that while this scenario may seem far fetched, it is depicted here to underline the following major point: the removal of bison from WBNP will not eliminate the fear of infection from other wildlife species. Agriculture Canada's proposal will only eliminate, at a great environmental, social and financial cost, one easily identified reservoir. And even that is not certain.

CONCLUSIONS

Concerns about the impact of brucellosis on the livestock industry are justified. However, it is not acceptable that concerns about transmission of brucellosis from bison to cattle should be solved by removing the present bison population from WBNP. As previously stated, the hybridization issue and the "fear" about the spreading of brucellosis to bison in the Mackenzie Bison Sanctuary do not rationally justify the WBNP removal program. Unfortunately, those two issues have been aptly used by the livestock industry to support their removal option.

Technically, and in spite of its logistic aspects, the bison removal option may be the easiest to implement. In essence, it involves killing animals from helicopters in winter concentration areas at an initial rate of some 1,500 animals per year over three years. It is believed that the rate will decrease with the decreasing number of animals left. Nonetheless, total, confirmed "depopulation" will take up to 15 years. Then genetically "pure" and "healthy" wood bison will be gradually reintroduced. It is unfortunate that this ingenious plan has to take place in a National Park, designated as a World Heritage Site by the United Nations. It is also unfortunate that there is no guarantee that brucellosis would be indeed eradicated and it will not re-occur again. It is unfortunate that we do not know for sure whether other wildlife species, carrying *Brucella abortus*, can re-infect the new bison population. It is unfortunate that we do not even know for sure whether there is indeed a real risk of transmission of brucellosis from free ranging bison to cattle. It is also unfortunate that we have no substantial data, but only personal opinions, about the impact of the removal option on the Wood Buffalo National Park ecosystem. It is unfortunate that there is no certainty that the cost of the removal option, now estimated at some 24 million dollars over 15 years, will not double or triple.

Ultimately, the removal option stands as sad commentary about the status of the wildlife and veterinary professions. Contrarily to what Agriculture Canada and some Government Agencies want us to believe, the wildlife profession is clearly divided about the need for the removal of bison from WBNP. This is shown by the content of several submissions to the Environmental Review Assessment Panel. It is also indicated by the tone and content of questions raised on the subject at the recent first meeting of the Alberta Chapter of the Wildlife Society. Opting for the removal option is comparable to a physician deciding to amputate a patient's leg without knowing whether is really necessary, whether it will be of any use, and without first trying other less traumatic options. We must not accept this approach. Removal of the bison population is a radical management decision with potentially serious social, political and environmental consequences. It should not be implemented as long as a more complete information base is not available and until other more environmentally sound options have been tried.

In its report, the Bison Disease Task Force has attempted to review the various options available to deal with the disease problem in WBNP. The preference by the task force for the bison removal program is evident. That option was then wholeheartedly embraced by Agriculture Canada. In contrast, I believe that, considering the uncertainties and implications associated with the bison removal program, there is some merit in maintaining the status quo or in attempting to confine the diseases to Wood Buffalo National Park by a "*combination of strategically placed fences, buffer zones with active bison elimination, and further disease and population dynamics research*" (Option # 9). This option could also include periodic testing and population reduction programs in Wood Buffalo National Park similar to the wapiti population reduction programs conducted in Elk Island National Park. Ultimately, that reduction led to the eradication of brucellosis from the area.

SUMMARY

I consider the proposal to remove bison from Wood Buffalo National Park unacceptable for the following reasons.

* The presence of hybrid populations is a common occurrence in nature. No biologist is suggesting the removal of other hybrid. The bison population in Wood Buffalo National Park is a valuable historic, genetic and environmental resource. Its value is not the least diminished by its hybrid nature.

* Concerns about transmission of brucellosis and tuberculosis to the Mackenzie Sanctuary bison are misplaced. Diseases and parasites are the norm in free ranging wildlife populations. Diseases can seriously affect population levels and they can even be a serious human health hazard. There is no evidence to suggest that brucellosis and tuberculosis lead to the demise of bison populations. Transmission of the diseases to the Mackenzie Sanctuary population would be unfortunate, but protecting that population by destroying another one is absurd.

* There is conflicting evidence about the transmission of brucellosis from bison to cattle. While transmission occurs in experimental conditions, or with animals in close association, experts disagree about transmission in

free ranging populations. The Bison Disease Task Force acknowledged the need for research on disease transmission.

* There is insufficient information about the incidence and distribution of brucellosis in other wildlife species. The Bison Disease Task Force acknowledged the need for research on whether other wildlife species will act as vectors for brucellosis in the absence of a bison reservoir.

* There is no guarantee that after such a massive intrusion in a National Park, brucellosis would indeed be "eradicated" from the region.

* There is no information about the impact of the removal option on the ecosystem of Wood Buffalo National Park.

* The removal of bison from WBNP is a radical management decision with potentially short and long term social and environmental consequences. On ethical, moral and biological grounds, it should not be implemented until all other options have been tried.

LITERATURE CITED

Blith, C.B. and R.J. Hudson. 1987. A Plan for the Management of Vegetation and Ungulates. Resource Conservation, Elk Island National Park, Environment Canada - Parks, Calgary

Kingscote, B.S., W.D.G. Yetes, and G.B. Tiffin. 1987. Diseases of wapiti utilizing cattle range in southwestern Alberta. J. Wildl. Diseases 23:86-91

Mccorquodale, S.M. and R.F. DiGiacomo. 1985. The Role of Wild North American Ungulates in the Epidemiology of Bovine Brucellosis: A Review. J. Wildlife Disease 21 (4): 351-357.

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TO: Northern Diseased Bison Environmental Assessment Panel

FROM: E.B. Peterson **DATE:** 6 February 1990

SUBJECT: Review of three additional reports related to habitat changes in Wood Buffalo National Park

Since the hearings of the Northern Diseased Bison Environmental Assessment Panel ended in Edmonton on 26 January, 1990, Colin Lachance has sent me three reports that the Canadian Parks Service gave him on 26 January. These reports were not reviewed by me when I prepared the vegetation dynamics report for the panel in the period from late August to early October. I have now read them and following are my comments. In my opinion, this new information does not invalidate the points recorded as "short answers" on pages 153-200 of the October 1989 Compendium.

1. Report, dated July 1989, prepared by Duane McNaughton, National Hydrology Research Institute (NHRI), Saskatoon, for the Canadian Parks Service, Fort Smith, under the title "Hydrological investigations, Wood Buffalo National Park, Interim Report, 1986 to 1988".

This work had its origins in 1976 when NHRI began studies to assist Pine Point Mines in designing dewatering systems for their open pit operations. As I stated near the end of the public hearing on 23 January in Fort Smith, I was uninformed about reports dealing with the Pine Point Mine dewatering system. When I summarized available vegetation-related information at the panel's request, I did not visualize a link between Pine Point dewatering operations and the vegetation of the primary bison ranges within Wood Buffalo National Park. The latter are mapped on Pg 238 of the panel's October Compendium. That assumption may or may not have been valid. For example, a 1983 report by K.U. Weyer is cited by Duane McNaughton as evidence that there is "no significant permeability impedance between the Pine Point Barrier complex being dewatered and the extensively karstified formations underlying Wood Buffalo National Park". However, a 1983 modelling study of regional ground water flow by Geological Testing Consultants Ltd. of Ottawa concluded that "model-predicted effects of dewatering beyond the reef were insignificant". Because of this difference of opinion, the Canadian Parks Service and the Environmental Protection Service asked NHRI in 1985 to monitor surface and ground water levels at three sites within the park.

In 1986 NHRI suggested that this hydrological monitoring be continued until 1990, by which time "sufficient data would have been gathered to allow some conclusions to be made with respect to visible trends in surface and ground water availability in the whooping crane nesting area". Although Pine Point Mines stopped dewatering when operations were suspended in 1987, the monitoring by NHRI is still in progress because of concerns about climate change and its possible effects on the wetlands that make up the whooping crane nesting grounds. Locations of the NHRI monitoring sites are shown on the next page (reproduced from McNaughton's Figure 2). These study sites are all in the Northwest Territories and are northeast of the primary bison ranges mapped by Messier (Pg 238 of Compendium).

McNaughton's main conclusions are summarized below.

For the Slave River, based on instantaneous flow records from 1953 to 1987, McNaughton concluded that "while there has been a very general tendency for flows to follow a somewhat sinusoidal pattern, with a period of about 10 years, there is no discernible tendency for flows in the river to increase, or decrease over the long term." For the Buffalo River, instantaneous discharge data from 1969 to 1987 "do not indicate any long-term trend toward lower flows in the Buffalo River, which tends to confirm the observations made above for the Slave." McNaughton indicated that "there is definitely no shortage of ground water in the lowlands over which the Buffalo River flows on its way to Buffalo Lake."

At 10 marl ponds monitored in northeastern Wood Buffalo National Park there has been "a very general decrease in water level elevation over the period 1986-1989. Monitoring has not been maintained long enough for this to be verified, however, and readings made over the next two years (1989 and 1990) will provide a more complete picture." McNaughton indicated that in 14 shallow piezometers drilled in 1985 at the Sass, Klewi, and Sass-Klewi sites, "the readings show the same pattern of water level variation as the pond gauges. This is to be expected, because these are very shallow piezometers completed in peat, connected hydraulically to the ponds. The ground water data show that there has been, with the exception of piezometer 12 on the Sass-Klewi Site, a very slight decline of ground water levels over the period of record (1985 to 1988), although the trends are very uncertain, given the short term of data collection. The following two years of data will increase the certainty of the results, by either showing a continuation of the "trend", or by obviating it."

McNaughton concluded that "the yearly fluctuations seen in both the ponds and shallow piezometers indicate that the wetland study sites are in a large ground water discharge area." He also suggested that "the contribution of large volumes of ground water to the wetlands from the regional ground water flow system discharging from the Western Canada Sedimentary Basin would tend to stabilize the wetlands against short term decreases in annual precipitation." The hydrometric data that were gathered in this NHRI study indicate that there does not appear to be any discernible trend to reduced baseflow in the region's rivers whose discharges were graphed over the entire period of record.

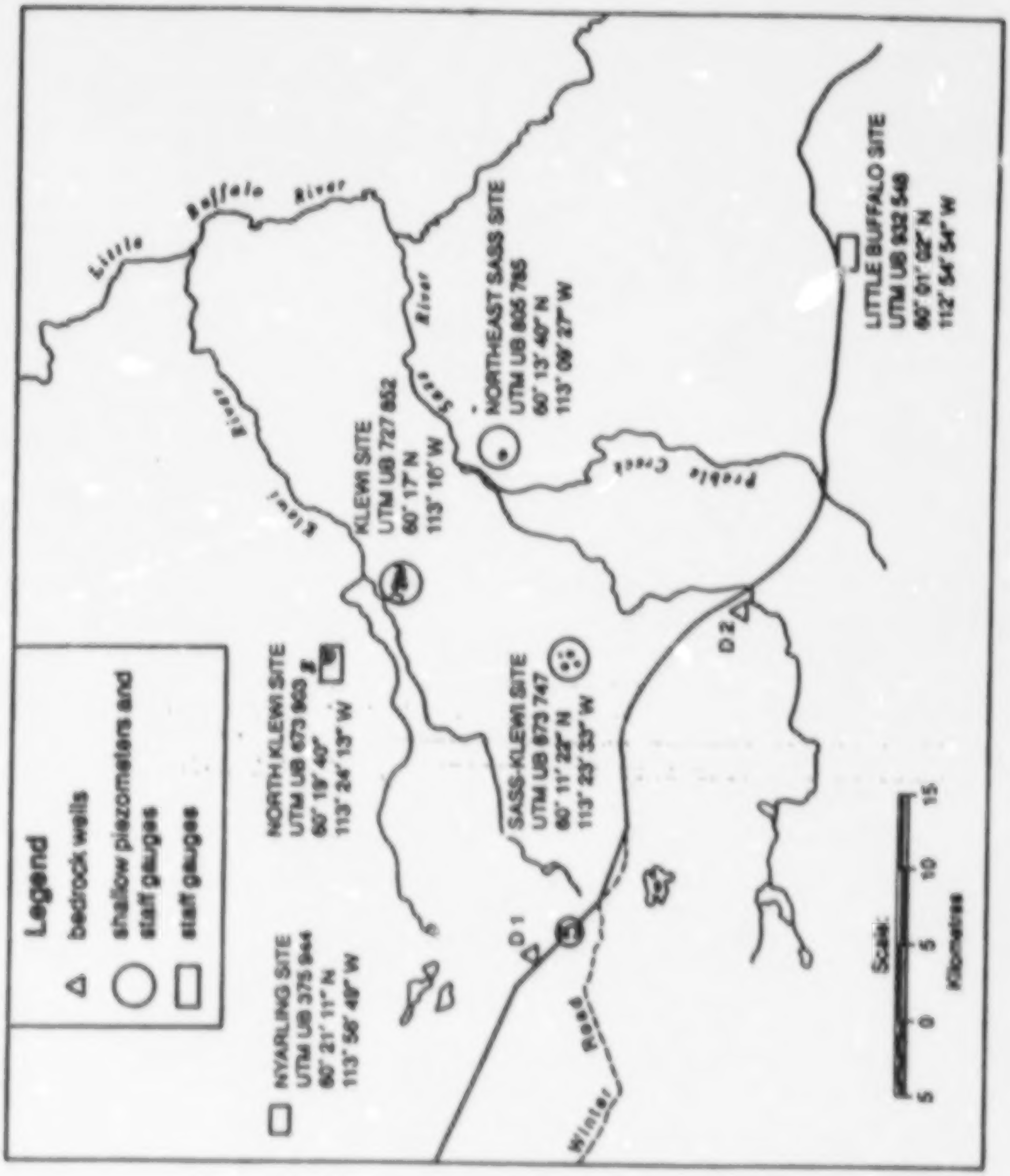
Legend
bedrock wells
shallow piezometers and staff gauges
staff gauges
NYARLING SITE
UTM UB 375 944
60° 21' 11" N
113° 56' 49" W
NORTH KLEWI SITE
UTM UB 673 903
60° 19' 40"
113° 24' 13" W
KLEWI SITE
UTM UB 727 852
60° 17' N
113° 16' W
NORTHEAST SASS SITE
UTM UB 805 785
60° 13' 40" N
113° 09' 27" W
SASS-KLEWI SITE
UTM UB 673 747
60° 11' 22" N
113° 23' 33" W
LITTLE BUFFALO SITE
UTM UB 932 548
60° 01' 02" N
112° 54' 54" W
Little Buffalo River
Klewi River
Sass River
Preble Creek
Winter Road
D 1
D 2
Scale:
5
0
5
10
15
Kilometres

Figure 2: Study Sites

On page 159 of the panel's October 1989 Compendium it was indicated that the vegetation types most heavily grazed by bison are as follows: (i) lowland meadows, on delta plains and river floodplains and around marshy lake margins, provide year-round range; (ii) prairie openings in forest are important summer range; and (iii) salt plains are mainly winter range, with some summer use. I cannot suggest how any of these habitats within the park would be changed by McNaughton's hydrologic observations in the general vicinity of the whooping crane breeding grounds. This is particularly so since the NHRI study did not reveal any tendency for flows in the Slave and Buffalo rivers "to increase or decrease over the long term" nor has it yet proven a continuous trend for decreased water levels in marl ponds or in shallow piezometers. Therefore, although these are important hydrological data that I overlooked in the August-October 1989 review, I cannot suggest any changes to statements and conclusions presented on pages 153-188 of the October compendium.

2. Report submitted to the Canadian Parks Service, Fort Smith, on 28 August 1989 by Ecosat Geobotanical Surveys Inc., North Vancouver, entitled "Topographic mapping and drying trends in the Peace-Athabasca Delta, Alberta, using LANDSAT MSS imagery".

The main purpose of this study was to use satellite imagery to identify hydrologic subdivisions within the delta area. The author indicated that this step is necessary to properly determine the subareas of the delta that will require field sampling to document vegetation changes occurring through time. Multi-date image enhancements were produced to identify which perched basins have experienced drying since the widespread flooding shown in the June 1974 satellite image. In addition, in a portion of the Lake Claire basin, estimates were made of areas flooded under each of seven water level regimes mapped by the LANDSAT MSS imagery. The purpose was to determine whether a direct correlation might be observed between the area flooded and the water levels measured within the sub-basin on the dates of LANDSAT imagery. If there were a close relationship then the area flooded under any given water level could be computed. This study revealed that, for the Lake Claire sub-basin, water levels as measured at Hydrometric Station 07KF002 (Lake Claire near outlet to Prairie River) explained 98.8% of the variability in flooded area as measured by LANDSAT imagery.

The 1989 Ecosat report defined subareas within the Peace-Athabasca Delta on the basis of similarities in hydrology, topography, vegetation and parent materials. This study assumed that "vegetational successional trends within each subarea will likely exhibit consistent patterns". The specific make-up of ecosystems within the delta were defined by Dirschl and Dabbs (1974) but they mapped only two transects that totalled 3,987.5 ha or about 0.9% of the Peace-Athabasca Delta. The author of the 1989 Ecosat report (presumably Dennis Jaques) made the following comments about additional ecosystem mapping in the delta area: "The terms of reference for this present study did not allow for mapping of the entire delta in this detail but the more general subareas defined provide a framework for this type of detailed ecosystem mapping. Detailed ecosystem mapping would be advisable for proper and complete analysis of delta ecosystem dynamics." Until this done, the references cited on pages 180 to 185 of the Panel's October 1989 Compendium remain as the primary sources of information. On the basis of the 1989 report by Ecosat I would not amend the basic information summarized on pages 180 to 185 of the Compendium.

The comments about drying trends on pages 183 and 184 of the Compendium, are corroborated by the 1989 Ecosat report. The latter study indicated all of the 1,111 small basins that make up the Peace-Athabasca Delta "require recharging by waters from their inflow sources to maintain water/vegetation edge and great diversity and complexity in juxposition of vegetation habitat types. Each of the 1,111 basins identified in this study could be identified as to the water level required to flood into it. The LANDSAT imagery used in this study has done that task for only the open drainage basins and those restricted or severely restricted drainage basins with obvious channel connections shown between them and the open drainage basins."

Page 184 of the Compendium emphasizes the 1987 PADIC conclusion that there is still a need for a long-term monitoring program to evaluate vegetation changes in the major habitat types, as they relate to water levels. Similar emphasis is given in the 1989 Ecosat report as follows:

> "... drying has occurred in many of the basins within the delta. No complete study has been conducted on these drying trends but several partial studies of the Delta have been concluded showing the vegetation changes occurring as a result of prolonged drying."

The Ecosat report identifies many areas that were covered by water in 1975, 1976 and 1981 but which were dry in 1985, and other areas that were dry in both 1981 and 1985. Recharging of these basins has not occurred since 1974 as such flooding requires a water level in excess of 209.96 m at Station 07KF002 on Lake Claire; such a water level had not occurred since 1974 at least up to the end of 1981 in the station records and up to 18 August 1985 from LANDSAT records.

Not all of the 1,111 mapped basins were evaluated for drying trends in the 10-year period from 1975 to 1985, but a 1:100,000 map prepared by Ecosat shows 122 basins that have experienced drying since 1975. These drying basins were not measured quantitatively by Ecosat but they were estimated to occupy 30 to 40% of the delta land base. Lakes that have completely dried since 1975 as well as dried shorelines of large open lakes were also mapped by Ecosat. However, the latter study concluded as follows:

> "The vegetation successional trends occurring throughout these areas drying since the flooding of 1974 have not been documented in this present study. Vegeteation change analysis is outside the terms of reference for this study. Rather, the hydrologic/ecologic subareas and areas experiencing drying since 1975 should receive adequate field sampling to document the current status of the vegetation on these different sites."

Of the six recommendations made in the 1989 Ecosat report, the following two relate to potential changes to key bison habitat as a result of water regime changes:

> "The water level contour digital maps and vegetation habitat type maps should be evaluated together to establish the water regimes controlling the observed vegetation changes. This data set should be evaluated with available research data to predict future vegetation successional patterns within each Delta subbasin."
>
> "An ecologically sound water flow/flooding regime should be established with appropriate authorities to insure that the Peace River can maintain the critical wetlands of the Peace-Athabasca Delta." (Ecosat Geobotanical Surveys Inc. 1989)

3. Report submitted to the Canadian Parks Service, Fort Smith, in May 1988 by Ecosat Geobotanical Surveys Inc., entitled "LANDSAT MSS imagery analysis of habitat type changes in 1976, 1981 and 1985 for the Peace-Athabasca Delta, Alberta."

This report was submitted under a covering letter signed by Dennis Jaques and is referred to below as Jaques (1988) to distinguish it from the 1989 Ecosat report. The report is based on images from 9 August 1976, 10 August 1981 and 18 August 1985, nearly identical times in the annual hydrologic cycle shortly after peak summer water levels.

The highlights of the 1988 report are:

> (i)"its demonstration that "LANDSAT MSS imagery can provide detailed and useful ecological information not available in any other practical form to monitor the ecological changes occurring in the delta wetlands";
> (ii) "flooding of perched basins has not occurred from 1976 to 1985 to any significant extent"; and
> (iii) "this lack of flooding has led to an extremely large increase in low shrub vegetation cover throughout the delta at the expense of mud flats, emergents, immature meadows and meadows."

Jaques (1988) was of the opinion that the potential exists for virtually all of the area of perched basins within the delta to succeed into low shrub cover within 15 to 20 years in the absence of significant flooding and drawdown on a frequent return interval of every 3 to 7 years.

The latter point does not change the point made on page 183 of the October Compendium, namely that "as the perched basins have become drier, the earlier successional communities are being replaced by more permanent species, such as willow and poplar (PADIC 1987)." The main point is that the Jaques (1988) report, which I overlooked in my information review, quantifies the increase of low shrub cover more emphatically than the information sources that I used.

The LANDSAT mapping by Jaques (1988) showed that open water in the Peace-Athabasca Delta declined from 66,738 ha in 1976, to 59,218 ha in 1981 and to 55,368 ha in 1985, for an average decline of 1504 ha/yr from 1976 to 1981 and 962 ha/yr from 1981 to 1985. It is this rate of drying, if projected to continue unchanged, that led Jaques (1988) to suggest that all perched basins could be dry within 15 to 20 years. There was some flooding of open basin portions of the delta sometime between 10 August 1981 and 18 August 1985. However, the "extent and location of recharging of perched basins which occurred as a result of this flooding activity remains unknown."

Jaques (1988) stressed that the "condition of perched basins at the present time remains unknown. Perched basins are known to be extremely important habitat units to wildlife in the delta. It is recommended that the perched basins receive immediate attention to evaluate potential long-term impacts of the operation of the W.A.C. Bennett dam on these important habitat areas."

In addition to the 1976 to 1985 reductions of water surface area mentioned above, Jaques (1988) recorded the following changes in major habitat types in a 193,800 ha study area centred on Mamawi Lake.

	Area, ha and (% of total study area)		
Habitat	1976	1981	1985
Low shrub	10,654 (5.5%)	19,716 (10.2%)	40,762 (21.0%)
Meadow	57,491 (29.7%)	44,200 (22.8%)	41,380 (21.4%)
Immature meadow (fen)	7,982 (4.1%)	24,481 (12.6%)	9,785 (5.0%)
Emergent vegetation	9,965 (5.2%)	2,123 (1.1%)	416 (0.2%)

Without repetitive flooding the meadow and immature meadow types will succeed to a low shrub habitat type; low shrub will eventually develop into tall shrub and forest habitat types. An important point brought out both by Jaques (1988) and the vegetation references cited on pages 180 to 185 of the Compendium is that vegetation succession proceeds quite rapidly in the Peace-Athabasca wetlands in the absence of flooding. Without flooding, succession can proceed up to the low shrub type in a few years. It requires several decades for the low shrub type to develop through the tall shrub types and to forest cover. The increase in area covered by low shrubs between 1976 and 1985 has come at the expense of the mud flat, emergent, meadow and immature meadow habitat types. The areas occupied by forest and tall shrub types showed no major changes from 1976 to 1985.

Although the report by Jaques (1988) has been summarized in considerable detail, I have no specific changes to suggest for pages 180 to 185 of the Compendium. There seems to be good evidence that meadow habitats important to bison in the delta portion of the bison primary ranges have declined in total area from 1976 to 1985. However, I am not aware of any evidence to suggest that this decline - and the accompanying increase in cover by the low shrub type - have made forage availability a controlling factor in areas where bison populations are decreasing in the park. In my opinion there is still a consensus amongst bison specialists that forage availability is not a controlling factor for northern populations of bison (Pg 169 of Compendium).

A caution by Jaques (1988) also makes it difficult to interpret the LANDSAT analyses in relation to key bison habitats, as revealed by the quotation below:

> "The assignment of each LANDSAT Classification Unit (LCU) into one of the eight Habitat Types provided the basis for the assessment of changes described previously. Due to the lack of accurate correlation of these LCU's with actual detailed ground truth field data, these assignments are tentative and preliminary in nature. Therefore, until a more quantitative assessment of each LCU's ecological make-up is conducted these assignments must be considered as tentative."

The first recommendation of the report by Jaques (1988) refers again to the tentative nature of the quantitative assessments as follows:

> "A detailed analysis of available LANDSAT MSS imagery should be conducted throughout the entire Peace-Athabasca Delta region to document the extent and nature of major ecological changes which have occurred throughout the region since decline of the 1972-1974 flood waters. The ecological habitat type changes identified in this preliminary study have not been adequately documented with available ground

> truth information to provide large confidence in either the location or quantities of habitat type changes measured by this study."

Despite the cautions by Jaques (1988) cited above, the 1988 and 1989 reports by Ecosat provided new quantitative estimates of habitat changes in the delta area of Wood Buffalo National Park, with emphasis on hydrologic changes to perched basins. The review prepared by Western Ecological Services Ltd. for the Panel focussed on the key habitats used by bison rather than on perched basins per se. There is a suggestion by Jaques (1988), perhaps inadvertent, that closed basins may be more important for other wildlife species than for bison. His conclusions section ends as follows:

> "As the closed basins provide by far the greatest amounts of important habitat for waterfowl and furbearing mammals in the delta, the elimination of the early successional habitat types by this invasion of low shrub would produce major negative impacts on the populations of these animals species within the delta."

In summary, the information presented in this memorandum complements the habitat information printed in the Compendium, because these three reports were missed when the review was prepared. However, as the paragraphs above indicate, this additional information does not compel me to amend any of the 'short answers' that follow the questions on pages 153 to 200 of the Compendium.

NWPS
NORTHWEST WILDLIFE
PRESERVATION SOCIETY

February 27, 1990

BY COURIER

Mr. Colin Lachance, Executive Secretary
Northern Diseased Bison
Environmental Assessment Panel
510 - 750 Cambie Street
Vancouver, B.C.
V6B 2P2

Dear Mr. Lachance:

RE: Northern Diseased Bison - Written Submission

WHO WE ARE

Northwest Wildlife Preservation Society (NWPS) is a nonprofit society and charitable organization founded in 1987, Canada's Wildlife Centennial. Our mandate is primarily an educational one as education - understanding - is the key to making right decisions. Through our educational programs, we encourage balanced perspectives on the preservation of whole healthy wildlife systems.

Our name reflects the clear definition of "Preservation", that being defined in Webster's as "keeping safe; to keep from harm". We believe that strong preservation efforts must become part of all future wildlife management priorities and practices.

Upon a review of the attached, you will undoubtedly note that our early efforts focussed a great deal on the wolf, efforts which have played a significant role in contributing to open discussions between differing viewpoints regarding wolf management in B.C. As a result of the 1988 Technical Wolf Symposium we facilitated and sponsored in Vancouver, a public advisory group to the B.C. Government was formed. The "Wolf Working Group", in which we participate, assists the Ministry of the Environment, Wildlife Branch, in the formation of a balanced provincial wolf management strategy and public review process.

Northwest Wildlife is actively involved in other issues and we are members of a number of coalitions both regionally and nationally. We are also the official B.C. distributor of World Wildlife Fund's endangered species school program, Operation Lifeline.

.../2

P.O. BOX 34129 STATION "D", VANCOUVER, B.C. V6J 4N3
(604) 736-8750

Northwest Wildlife Preservation Society supports the conservation of native flora and fauna, and the restoration of native habitat and eco-system processes wherever possible. This, as a whole, forms the basis of our submission to the NDBEAP.

THE BISON CHALLENGE

We fully recognize the complexity of restoring the Wood Buffalo National Park (WBNP) eco-system to as close as possible to its original form. We view this as an opportunity to "undo" - albeit with certain effects - what humans caused to occur in this particular eco-system through the introduction of diseased Plains bison. We fully recognize the differing perspectives from the agricultural, native, conservation, and resource use communities. NWPS's Objectives are geared toward decision-making that emphasizes what is best for the whole eco-system, not primarily what may benefit specific user groups. If it is possible to restore the system, the genetic purity of the Wood bison, and eliminate disease, resource users could eventually recognize a benefit -- one that will no longer exist should this situation remain unchecked.

We support The Wood Bison Recovery Team Recovery Plan for WBNP. Their specific Objectives and main Goal are compatible with the overall Objectives of Northwest Wildlife Preservation Society (see enclosed "Purpose and Objectives"). However, we clearly recognize the challenges in "how" to carry out their Objectives and Goal.

Often the public, meaning well, is not given sufficient opportunity to fully understand the facts around a situation. For example, in this case, although public hearings have been held in local communities associated around WBNP, a significant portion of the general public in and around southern B.C. (and the rest of Canada?) do not clearly know and understand the issues. Their attitudes and support or non-support of decisions is dictated by their lack of information. This situation affects a National Park and should therefore include a significant portion of the Canadian public as well as those in the local communities near WBNP.

If the general public at large were informed as to the seriousness of not taking action to eliminate the diseased and hybrid bison in a methodical and environmentally balanced manner, they may be more inclined to support actions to "right the wrong" that has been done to the bison and eco-system in WBNP.

There is some history to draw upon in this regard. For example, the publics' criticism of culling Plains bison in the early 1900's at Wainwright resulted in diseased Plains bison being

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transferred to WBNP. As well, warnings from the American Society of Mammalogists in 1925 and others were not taken seriously. Their warnings came true: that the introduction of Plains bison into Wood bison range would result in interbreeding with possible loss of both species, as well as the transference of disease. Both have occured.

Human society is fortunate indeed to have found that pure Wood bison do indeed still exist in WBNP. We view this situation to be serious and that time is of essence, particularly in light of the fact that the disease will spread to the other remnant populations of Wood bison, other wildlife, and even livestock outside of WBNP. It is our position that the time for "further research" is long since past.

OUR POSITION

NWPS supports the IUCN's Bison Specialist Group of the Species Survival Commision position to eliminate diseased bison in WBNP (and the surrounding area) and replace them with disease- free, genetically pure Wood bison. This would result in the eventual repopulation of the approximately 72 percent of area where it is still possible to restablish free-ranging herds, as well as the repopulation of genetically pure, disease-free bison in WBNP. This would also provide an opportunity for the current government policies to change, which discourage the establishment of free-ranging bison herds due to the disease risk that they carry or may contract.

Bison are described as a keystone species, occupying a niche that no other native herbivore can. The hybrid bison in WBNP pose a real and serious threat to the long-term genetic purity of the remnant Wood bison herds, to the health and reproductive capability both of the remnant Wood bison and hybrid bison, as well as to other ungulates within the National Park. There appears to be no risk-free mechanism to confine the diseased bison and we recognize that these bison in and around WBNP are the only remaining wildlife reservoir of bovine brucellosis and tuberculosis in Canada. By eliminating these two diseases in the region the single greatest obstacle to the recovery of Wood bison in the area would be removed. So, too, would the greatest threat to the health of livestock outside of WBNP be eliminated.

Bison are a major prey item for wolves, particularly in WBNP. In order to mitigate excessive damage to the stability and long-term health of this wildlife system, Northwest Wildlife Preservation Society suggests the following:

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SOME SUGGESTIONS

1. A high-profile public education program (not media-directed) aimed at the mainstream public in order to assist them to clearly understand the complexities and urgency of the situation as well as the resuts of excessive action/non-action.

2. Following testing of bison, those proven diseased and/or hybrids would be trucked out of WBNP to be humanely euthanized and then cremated. We suggest this in order to reduce the complications inherent with

   i) allowing National Park wildlife to be "culled", hunted, or slaughtered in a National Park where the killing of wildlife is a illegal;

   ii) the handling of diseased animals and potential transfer of disease is thereby greatly reduced;

   iii) the media emphasis put on a "slaughter" would be reduced.

   If it is proven scientifically that meat by-products from diseased bison can be safely consumed by humans, would it be possible to provide such by-products at a low-cost to residences and others, rather than cremate the diseased/hybrid bison?

Following this, re-introduction of disease-free, genetically pure Wood bison from the remaining remnant herds would then be undertaken in order to both broaden the diversity of the genetic base of the Wood bison in WBNP and to provide a prey base for the predators in the system.

Public interest in the Northern Diseased Bison Debate may be high, but an informed, broad-based public is still not driving the decisions. Media coverage has been biased. It is Northwest Wildlife's opinion that the IUCN World Conservation Strategy RENEW priorities and policies should be implemented to mitigate damages in this situation, and that the recommendations as prepared by the Wood Bison Recovery Team be seriously considered. NWPS would be pleased to provide an opportunity for greater public awareness into this challenging, urgent situation.

Sincerely,

NORTHWEST WILDLIFE
PRESERVATION SOCIETY

Sherry L. Pettigrew,
Executive Director

SLP/sjp
encl.

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R.R.# 1
Vimy,
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Mr. Colin Lachance
Executive Secretary
Northern Diseased Bison Environmental
Assessment Panel
#510 - 750 Cambie Street
Vancouver, B.C.
V6B 2P2

Dear Mr. Lachance:

This letter is in response to Dr. N.S. Novakowski's "anecdotal critique" of Mr. Laviolette's submission (Needle Lake-Providence Wood Bison Transplant Report) and his covering letter addressed to you. I have received Mr. Laviolette's approval for this action.

When I first read the Novakowski submission, which no one received until the hearings were over, I was so shocked and infuriated that I found it difficult to respond in a dignified manner.I suppose I could have let it go without response and would have done so had his statement not been a matter of public record. However, over the ensuing weeks I have cooled off a little and now feel that I can respond a bit more objectively for the public record.

I and other readers found certain statements in the covering letter particularly offensive. In reference to the Agriculture Canada proposal for eradication of all hybrid bison and replacement by wood bison, which Novakowski obviously supports, he states - "I find any protestations to the contrary to be singularly devoid of common sense, propriety and intellectual honesty." In other less scholarly words, he says that all people who object in any way to the Ag Canada proposal are stupid, do not conform to accepted standards of behaviour, and are deliberately dishonest. It is unfortunate that he lacked the courage of his convictions and/or the intestinal fortitude to make such statements to Mr. Laviolette or in the public hearings at Ft. Smith, Ft. Chipewyan or Edmonton, where there were many people who "protested" the Ag Canada proposal. I am sure he would have found a very responsive audience, had he done so.

The second statement which may require clarification for the panel was his reference to "voodoo science" which he claims was "in many of the submissions" to the panel. This puzzled me for a short time until I read the date of his submission, which was Jan.11, 1990 and his reference to papers by the Dene Cultural Institute (Diseased Bison in Wood Buffalo National Park - An Aboriginal Perspective) and Theresa A. Ferguson's paper (Native Perspectives on the Diseased Bison Issue). Until the hearings began (Jan. 16,1990), those papers were the only submissions which originated with the aboriginal people who were most directly affected by the bison eradication program. These were genuine concerns of native people based on their long experience with bison and life on the land and with ill-considered programs such as the original introduction of diseased bison and errors in the subsequent disease eradication programs. To call such traditional knowledge of aboriginal people "voodoo science" is at best arrogant and at worst a direct insult to native people.

His critique, which is supposed to correct statements made by Mr. Laviolette and tell more of the 1960's bison transplant and disease control history, actually adds nothing of value to the bison story. In any case, whether Mr. Laviolette was correct or not in his statements regarding bison round-ups, testing, etc. is irrelevant at this date.

What Novakowski has done is an attempt to discredit not only Mr. Laviolette but other Dene elders who were very upset by the way bison were abused during various programs in the 1960's. These elders are still very concerned that programs such as that proposed by Agriculture Canada will also result in abuse of a sacred animal. Mr. Laviolette only attempted to express the feelings of most Dene people. Novakowski's purpose in writing this submission is still a mystery to us all - although it may be only a defense of his own and others' errors in judgement and action while he was involved with the bison programs of the past. Whatever his motives, Novakowski has certainly lost the respect of the elders of Fort Smith region by his underhanded attack on Mr. Laviolette and has done nothing to enhance the credibility of biologists and other wildlife management people who deal with the concerns of native people and the resources on which they depend.

In conclusion, I would recommend that the panel at least: (a) disregard all of Dr. Novakowski's submission in its deliberations and (b) ask him to apologize in writing to Mr. Frank Laviolette, the Dene Cultural Institute, Yellowknife, Theresa Ferguson, and all aboriginal bison user groups. The latter could be done by letter to the Treaty 8 Chiefs and Metis leaders around Wood Buffalo National Park.

I trust that you will enter this letter in the compendium of hearing submissions on behalf of all those who wish to resolve the diseased bison issue without eradication of hundreds of healthy bison, hybrid or otherwise, around Wood Buffalo National Park.

Respectfully yours,

Robt A Ruttan

Robert A. Ruttan
Wildlife Biologist

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TOG 2J0

Mr. Colin Lachance
Executive Secretary
Northern Diseased Bison Environmental
Assessment Panel
#510 - 750 Cambie Street
Vancouver, B.C.
V6B 2P2

Dear Mr. Lachance,

I have been asked by the Fort Smith, Fort Fitzgerald and Fort Resolution bands to bring the attached information to the attention of the panel as soon as possible. I would also ask that the panel contact Environment Canada or other appropriate agency concerning Agriculture Canada's activities in the Fort Smith area.

Respectfully yours,

Robert A. Ruttan

Information for Environmental Review Panel

This is to advise the panel regarding actions associated with the diseased bison issue and to protest the action which Agriculture Canada is taking before the panel has prepared its report.

Current attitude and action of bison user groups

Although the bison user groups rejected the Agriculture Canada proposal, this does not mean that they are not concerned about the disease problem. Research to this point indicates that control of the diseases by eradication of the WBNP population is neither desirable nor practical. However, control of the recorded diseases without destruction of the bison resource is both desirable and feasible if conducted in the proper manner. To this end, a counter proposal (similar to that mentioned in the Treaty 8 submission) is to be discussed at a meeting of Treaty 8 chiefs and band representatives on March 6, 1990 at Edmonton. The counter proposal will address the issue of disease control as well as management of bison populations in the long term. It is expected that at least an outline will be prepared and distributed to panel members and to appropriate government agencies by March 15, 1990.

Agriculture Canada actions

With few exceptions, user groups of the NWT who are aware of it protest the premature and unsolicited action of Agriculture Canada in developing agreements with the Fort Smith Metis Association (see appended letter). While the idea of organizing representatives of bison user groups is good, we do not feel that Agriculture Canada's action with the Metis Association is their responsibility. Ag Canada's basic role should be that of a resource group which researches and designs methods of testing for incidence of disease in the population and for disease control such as inoculation and provides funds for developing and implementation of disease testing programs in the field.

Their recommendations for subjects to be discussed (see Meeting Results) at the proposed meeting are also unrealistic - since the background research for all of these subjects would require months of research and when completed, would require an extended time for review and planning of appropriate action. Furthermore, items 2.1, 2.2 and 2.3 plus several other issues will be addressed in the fully developed counter proposal (see Treaty 8 submission). Agriculture Canada's actions as expressed in their communications with the Fort Smith Metis Association (see also Jan. 24 letter) indicate an arrogant lack of interest for the concerns or recommendations of those people most closely associated with WBNP bison and a deliberate attempt to implement their original proposal despite any protests to the contrary.

In my opinion, if Agriculture Canada is sincere in its concerns for eradication or control of disease in the WBNP bison, they will (a) respond positively to Treaty 8 requests for funds to develop a realistic research and management program and (b) accept some direction as a resource agency for disease control.

It is therefore requested that Environment Canada ask Agriculture Canada to cease and desist in its premature direct actions but be prepared to act in a supportive role to recommendations made by combined buffalo user groups.

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RECEIVED

MAR 2 - 1990

FEARO PACIFIC

10 Harry Collins Avenue
WINNIPEG, Manitoba
R2M 4N2

25 February 1990

Colin LaChance
Executive Secretary
Northern Diseased Bison Environmental Assessment Panel
510-750 Candie Street
VANCOUVER, BC
V6B 2P2

Dear Mr. LaChance:

I am writing to make known to your panel my concerns regarding the bison problem in Wood Buffalo National Park. I am not an expert on all the issues relating to this difficult situation. However, as a research ecologist with more than 20 years experience studying natural and perturbed ecosystems, and having read a number of reports on this problem, I wish to offer several comments.

I am particularly concerned by the unequivocal position taken by Agriculture Canada that the entire bison herd in Wood Buffalo National Park must be killed. Not only is this the largest wild herd of bison now in existence, but it represents, by far, the largest bison gene pool in the world. In addition, this herd is an integral and major component of the Wood Buffalo National Park ecosystem. Eradication of this herd would both destroy this priceless source of genetic diversity and seriously disrupt the ecosystem of a National Park and World Heritage Site. Such a slaughter should be considered only as a last resort. I do not believe that it can be justified by the evidence at hand.

While it is clear that the bison in Wood Buffalo National Park are seriously affected by tuberculosis and brucellosis, it is not clear that these diseases will eventually destroy this herd. Indeed, much of the recent bison population decline can be attributed to drownings and other sources of mortality. Fluctuations in numbers are common in natural populations, particularly in populations subjected to stress. It is entirely possible that, given time, this population will develop resistence to the diseases and will survive. Development of suitable vaccines would also serve to assist the survival of these bison. While any reasonable opportunity exists for the survival of this gene pool, every opportunity must be taken to provide it.

The disease-free bison herd in the Mackenzie Bison Sanctuary is also a precious resource and should be actively protected.

However, it represents a very small pool of genetic material and should never be considered as an adequate replacement for the Wood Buffalo Park herd.

The issue of protection for cattle on ranches to the south of the Wood Buffalo National Park is important. However, intrinsically the bison are a much more valuable resource than are a few cattle. Ranchers and provincial or local governments must be prepared to keep the cattle fenced in and properly vaccinated to minimize any possibility of their contracting the diseases. Regular testing of cattle would help to identify any transfer of the diseases, should it occur. A cattle- and bison-free buffer zone should be established and actively maintained between the park and the ranches. Wood Buffalo National Park was established as a wilderness refuge for the bison. Its viability must not be compromised through encroachment from domestic livestock.

Similarly, a bison-free buffer zone between the Park and the Mackenzie Bison Sanctuary would assist in preventing contamination of the Mackenzie herd until such time as the diseases in the Wood Buffalo Park herd can be controlled.

Eradication of the Wood Buffalo Park bison, as advocated by Agriculture Canada, would result in a major disruption of the Park ecosystem. Large carnivores would starve and increased predation of livestock on neighbouring ranches probably would occur. The resultant cascade effects throughout the food chain could be disastrous. Such ecosystem disruption is never desirable. It is particularly abhorrent within the confines of a national park. Despite this high ecological cost, there are no guarantees that the diseases would be eradicated from the park. If some small pocket of disease persisted, any bison reintroduced at a later date could become infected and the same problems would re-emerge. However, the priceless genetic material from the present Wood Buffalo Park bison would have been irretrievably lost.

I am always concerned when major wildlife management schemes are recommended. Too often they lead to unforseen difficulties with no simple solutions. We do not understand the complexities of natural ecosystems in sufficient detail to confidently manage them. When the results of such a management scheme are irreversible, it should be undertaken only as the absolutely last resort. Based on the evidence available to me, the wholesale slaughter of the Wood Buffalo National Park bison herd is not justified at this time.

Contact between diseased bison and non-diseased animals (cattle or bison) should be prevented by the active maintenance of buffer zones around the Park. Concerted efforts Agricultural interests must share some responsibility by monitoring their livestock, and by recognizing the importance and sensitivity of natural ecosystems. Development of vaccines suitable for

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treating bison in the wild should be encouraged. The integrity of the Wood Buffalo National Park ecosystem must be preserved if possible.

Yours sincerely,

John A. Shearer,

John A. Shearer

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Indian and Northern Affairs Canada
Affaires indiennes et du Nord Canada

Deputy Minister
Sous-ministre

Ottawa, Canada
K1A 0H4

MAR - 1990

Mr. R.G. Connolly
Chairperson
Northern Diseased Bison Environmental Assessment Panel
Federal Environmental Assessment Review Office
13th Floor, Fontaine Building
Hull, Quebec
K1A 0H3

Dear Mr. Connolly:

Northern Diseased Bison Environmental Assessment Panel

Officials of the Alberta Region for Indian Affairs and Northern Development have been monitoring the progress of the Panel in particular reference to the oral and written submissions of aboriginal people.

I am aware Agriculture Canada's proposal to eradicate all the bison in Wood Buffalo National Park is but one option before the Panel. Nevertheless, Agriculture Canada's proposal has been viewed by the Indian leadership as the principal proposal. The Indian leadership opposes this option. They have cited the traditional and spiritual ties of Indian people to the land and wildlife, as well as their concerns for scientific, technical and managerial deficiencies of the proposal.

Indian leaders have recommended the Panel consider the need for additional time and resources for further studies, and the creation of viable alternatives to Agriculture Canada's proposal. In particular they have expressed a desire to be an integral part of the team that would create these alternatives.

Recently Chief Johnson Sewepagaham of the Little Red River Band wrote to you and copied our Alberta Regional office. Chief Sewepagaham suggested the creation of a round table consultation process involving the major stakeholders for this issue. The process he described is modeled after the highly successful community based prototype pioneered by the Fort MacKay Band in its negotiations with major oil companies and the Province of Alberta. The Chief indicated he would seek support for this endeavour from this department and Agriculture Canada.

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I wish to advise you that this department supports, in principle, the approach proposed to you by Chief Sewepagaham. It is the position of the department that the use of this consultation model could assist in the successful resolution of an extremely complex issue.

It is not the position of the department that this model replace the current bison panel process. The department appreciates the Panel has a mandate to provide the Ministers of Environment and Agriculture with recommendations. Rather, the department views the consultation model as a potential recommendation by the Panel to promote a post-panel resolution of outstanding issues.

Should the Panel recommend this process be adopted, departmental officials are prepared to work with the Indian leadership and other stakeholders to achieve success.

Sincerely yours,

Harry Swain

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REPORT NUMBER TWO TO THE NORTHERN DISEASED BISON ENVIRONMENTAL REVIEW PANEL ON BISON GENETICS

(A CRITICAL EXAMINATION OF RECOMMENDATION WITH GENETIC IMPLICATIONS)

By R. T. Berg, Ph.D.,

Technical Specialist

March 2, 1990

1. The Problem

1.1 The Primary Problem

The primary problem for the Panel is to control or eliminate Brucellosis and Tuberculosis infecting Bison in and around Wood Buffalo National Park. There is nearly unanimous agreement that elimination of these diseases is a worthy objective. There is also general agreement that diseased bison could be eliminated, though many would prefer that the disease should be eliminated by appropriate treatment. Considerable opposition has been voiced against sacrificing healthy animals.

1.2 The Secondary Problem

The secondary problem given the Panel relates to the recovery and conservation of Wood Bison as a distinct sub species and the safeguarding of the genetic integrity of the recovered sub species.

Varying opinions have been expressed to the Panel on:

(a) whether the Wood Bison should be classified as a distinct sub species,

(b) whether the Bison in the Wood Bison Recovery Program are pure Wood Bison,

(c) whether there is a need to expand the gene pool of the recovered Wood Bison populations,

(d) how large and extensive the Wood Bison Recovery Program should be,

(e) and of the danger of hybridization and introgression to the genetic integrity of the Wood Bison from the Recovery Program.

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1.2.1 Sub Specific Status of Wood Bison

In my opinion the question of whether the Wood Bison should be classified as a distinct sub species is not a decision for the Panel. Rather this must be decided in a scientific forum. The present status of Wood Bison, recognized as a distinct subspecies, is clearly presented in the submission of the Wood Bison Recovery Team to the Panel. Under the National Strategy called RENEW (Recovery of Nationally Endangered Wildlife), endorsed by all Provinces, Territories, the Federal Government and major non-government organizations, a Wood Bison Recovery Team is in place which has the responsibility for developing plans that specify distribution and target population sizes required to remove the species from the endangered species list. Whether the decision of the Wood Bison Recovery Team respecting the sub species definition of Wood Bison, is a correct decision, will continue to be debated among scientists but should not be a debate of particular concern to the Panel.

1.2.2 Genetic Purity of Recovered Wood Bison

The question as to whether the Bison in the Recovery Program are pure Wood Bison may require some discussion. The concensus is that there has been some introgression of Plains Bison genes into the recovered Wood Bison population. This introgression leads Geist to argue in his presentation that effort should be directed to conservation of the total Bison gene pool rather than the "impoverished, distorted gene pool of the Nyarling River Bison". Again Geist's argument is with the RENEW Wood Bison Recovery Team and not with the Panel which would be bound to the nationally accepted decision of the Recovery Team.

1.2.3 Adequacy of the Gene Pool of Recovered Bison

The size of the gene pool determines the genetic variation in a population, which influences the population's ability to adapt and survive. As I mentioned in my previous report to the Panel, the Recovered Wood Bison populations arose from very small numbers which is called a genetic bottleneck. Passing through such a bottleneck results in inbreeding and a loss of genetic variation. The length of time (or the number of generations) that a population takes to get through the bottleneck increases the inbreeding and loss of genetic variation. The critical period is the bottleneck period, and as the population expands, no further inbreeding effects are imposed. How well a population which has gone through a bottleneck is endowed genetically, can be evaluated by how well it adapts in an evolutionary sense. This is measured by its survival and reproduction. The rapid increase of the Bison in the Mackenzie Bison Sanctuary (Gates et al., 1987) would be an indication that the gene pool of that population was adequate. Similarly a recent report from Elk Island National Park indicated that their Wood Bison herd showed an average rate of growth of 26.5% per annum from 1965 to 1983 which was larger and more consistent than for the much larger Plains Bison herd at the same location.(Status Review of Bison in Elk Island National Park. Personal Communication from W. Olsen. E.I.N.P. Feb.,1990.)

Of course, judgment of the adequacy of the gene pool of Recovered Wood Bison is rather subjective. As a Geneticist, I would have to agree with those who propose that genetic variation should be maximized in a conservation and recovery program to be more assured of success. In my opinion, however, the recovered populations have passed the critical stages in the recovery programs (i.e. the bottleneck and early expansion stages) with flying colours and I would be confident that their gene pool is adequate.

I question the concept presented by Van Zyll de Jong in his presentation that it takes "from a few hundred to a few thousand generations" to regenerate typical levels of genetic variation. There is recent evidence that there are genetic mechanisms that may be important in creating genetic variability in highly homozygous populations (Biemont et al., 1987).

However, I would support attempts to expand the gene pool of the Recovered Wood Bison by genetic salvage if feasible.

1.2.4 Required Size of Wood Bison Recovery Programs.

The Wood Bison Recovery Team have presented the acceptable minimum numbers needed to remove the Wood Bison from the Threatened Status. These are 4 herds of 200+ each. However, these are considered minimum requirements and they and others argue for much larger numbers. They also make a case for removal of all Plains and Hybrid Bison from Wood Buffalo Park and surrounding areas and repopulation with pure Wood Bison. The range from what is needed as a minimum and what is desired as ideal is indeed very large. In my opinion the Panel's recommendation should consider how much over the minimum requirement is feasible.

1.2.5 Genetic Integrity of Recovered Wood Bison.

The concern expressed by the Wood Bison Recovery Team that the presence of Hybrid Bison in and around Wood Buffalo Park is a threat to the genetic integrity of theWood Bison in the Mackenzie Bison

Sanctuary warrants discussion. As noted some introgression of Plains Bison genes into the Recovered Wood Bison is generally accepted. Also as Geist states introgression is a common occurrence in nature where two geographically isolated sub species overlap. Such introgression is one of nature's ways of introducing genetic variation to incompletely isolated populations. Further in the past 65 years there still remain Bison in the Hook Lake region that show little introgression of Plains' genes (Van Camp, 1989). There may be other pockets of relatively pure Wood Bison as well, since no extensive search for such populations have been made. It could thus be argued that introgression of further Plains' genes into the relatively isolated Mackenzie Bison Sanctuary population would be minimal or absent and would have minor impact and could be accepted as a natural evolutionary process.

2. Recommendations

2.1 The primary objective of the Panel should be to recommend a strategy to control or eliminate Brucellosis and Bovine Tuberculosis in Buffalo in and around Wood Buffalo National Park.

2.2 The minimum needs as enunciated by the Wood Bison Recovery Team should be accomodated (e.g. 4 herds of 200+ animals each).

2.3 Some of the wants of the Wood Bison Recovery Team should be accomodated if feasible (e.g.:

(a) widening the gene pool by genetic salvage,
(b) expanding the range reserved for Wood Bison,
(c) provide for greater expansion of Wood Bison numbers beyond the minimum requirements.)

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References

Biemont, C., A. Aouar, and C. Arnault. (1987). Genome reshuffling of the copia element in an inbred line of Drosophilla melanogaster. Nature 329:742-744.

Brynaert, K.A. (1990). The C.W.F. submission to the Northern Diseased Bison Assessment Panel. Jan. 1990.

Gates, C. et al. (1987). Status report on Wood Bison in Canada. Prepared by the Wood Bison Recovery Team. C. Gates (Chairman), Northwest Territories Wildlife Service, Fort Smith, N.W.T.

Geist, V. (1990). Northern Diseased Bison: A rebuttal of Agriculture Canada's Arguments to eliminate Bison from Wood Buffalo National Park. Submission to the Northern Diseased Bison Environmental Assessment Panel. Jan. 1990.

McCormack, P.A. (1990). Submission to the Northern Diseased Bison Environmental Assessment Panel. Jan. 1990.

Olsen, W. (1990). (Personal Communication.) Status review of Bison in Elk Island National Park. Feb. 1990.

The Wood Bison Recovery Team. (1990). Implications of diseased Bison populations in Northern Canada for the recovery of Wood Bison. A submission to the Northern Diseased Bison Assessment Panel. Jan. 1990.

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Van Camp, J. (1989). A surviving herd of Endangered Wood Bison at Hook Lake, N.W.T. Arctic 42: 314-322.

van Zyll de Jong. (1990). A statement to the Northern Diseased Bison Environmental Assessment Panel. Jan. 1990.

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l'Alliance mondiale pour la nature
The World Conservation Union

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Executive Secretary
Northern Diseased Bison
Environmental Assessment Panel
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21 February 1990

Dear Mr Lachance,

The International Union for Conservation of Nature and Natural Resources is charged by the World Heritage Committee to monitor the state of conservation in all World Heritage Sites. The Union, through its Commission on National Parks and Protected Areas, also maintains a Register of "Threatened Protected Areas". Should conditions warrant, the Union can make representation to the World Heritage Committee with respect to the placement of Wood Buffalo National Park on the World Heritage in Danger List.

I understand that Agriculture Canada is of the view that the bison herd in Wood Buffalo should be slaughtered to eliminate the possibility of infection with bovine tuberculosis and brucellosis to domestic cattle currently ranging to the west of the park.

It is our view that justification for the total elimination of the herd is at this time not scientifically based. The total elimination of disease is unlikely to be achieved, and the impact of such a drastic programme on the ecosystem as a whole remains an unknown quantity.

The argument that brucellosis has been wiped out in domestic cattle under highly controlled and fenced conditions is not applicable to a large free roaming (4000 plus) herd in an area larger than Switzerland. Furthermore, contiguous bison populations occupy ranges in the Northwest Territories and Alberta. It is easily conceivable that the area is at least twice the size of the park in question here.

Because we are dealing with a World Heritage Site, we would want the highest scientific standards to be applied and to have demonstrated that the feasibility of success, particularly from a conservation perspective, is assured before the elimination of the herd is considered.

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Wild ecosystems as large as Wood Buffalo National Park are a rarity in the world. To tamper with a major component of that ecosystem without understanding the ramifications to the total ecosystem would be most unfortunate.

We urge that your assessment panel extend the scientific inquiries essential to understanding the ecosystem and the genetic structures of the population prior to initiating a programme to eliminate the herd.

In the meantime, we urge interim risk containment measures such as extended patrols, and fencing of critical domestic cattle ranges. It would appear on the surface that restricting the northward migration of domestic cattle would be a more prudent course than what has been proposed by Agriculture Canada.

Yours sincerely,

Martin W. Holdgate
Director General

cc: M. Lucien Bouchard
Supt. Wood Buffalo National Park

Secretaiat, World Heritage Committee
Attn. B. von Droste